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Heavy Buying Southern Pig

Includes Seventy-five Thousand Tons for Leading Cast Iron Pipe Company and Fifty Thousand for Export

A heavy buying movement in southern iron has developed during the past two or three days and sales from that district will reach 100,000 tons for third and fourth quarter delivery. The United States Cast Iron Pipe & Foundry Co. alone took approximately 75,000 tons from three or four southern producers and a number of western consumers have been buying. One furnace interest booked about 40,000 tons. The prices paid on this large movement have been from $10.25 to $10.50 for third and fourth quarter delivery. Sales of southern iron for export foot up about 50,000 tons, of which about half will go to Australia and half to Austria and Italy. A leading southern maker has sold 10,000 tons of Alabama iron for delivery in England. The iron, it is understood, will go to a large consumer at Hull, and the price realized is reported to have been approximately the present market, on a basis of about $10.25, Birmingham. A similar sale of Alabama iron was made to this consumer several years ago.

Increased inquiry has appeared for pig iron in Chicago, where about 30,000 tons are pending; in New York, where inquiries for about 25,000 tons have been sent out and in Pittsburgh, where the demand for foundry grades shows improvement. The change for the better is not general, however, and extreme dullness prevails in some centers.

Pig Iron Production

The effect of low prices and limited demand for pig iron is shown in the reduced production for May, when the output of anthracite and coke pig iron was 2,096,593 tons, compared with 2,261,501 tons in April. There was a net loss of 14 in the number of active furnaces, following a loss of 20 in April. The decrease in production was due largely to the lessened activity of the steel works. A still further reduction in output is expected this month.

Iron Ore

The gloom which hangs over the lake trade this summer is reflected in iron ore shipments for May, the total being only 3,852,063 tons, compared with 7,284,212 tons in May, of last year. The shipments to June 1, this year, were 4,121,749 tons, compared with 8,150,599 tons in the same period of last year. There is possibly a little more interest manifested on the part of furnace men in their ore departments, but very few contracts are being made.

Railroad Buying

The buying of rails shows some improvement. The total for May was 110,000 tons, which was heavier than for either April or March. Car buying is very limited, but the recent placing of orders for plates for cars ordered some time ago has given a better tone to the plate market.

Finished Material

While it is understood that some recent sales of sheets were made at very low prices, the decline seems to have been checked and the condition of the sheet market in some centers is regarded as more favorable. Agricultural implement manufacturers continue to sound the market on steel bars and have done some buying, but in a limited way. Weakness has developed in bars and the 1.15c price has been freely shaded at least $1 per ton on desirable business for early shipment. Makers of hard bars, re-rolled, are quoting 1.10c at their mills. Prices of wire products are sagging and $1.50 is now the ordinary quotation on wire nails.

THE OPEN HEARTH

How Much is Left?

PROPOSED for legislation at this session of congress is a bill introduced in the House last week by Representative Stevens, of New Hampshire. The measure gives to the Interstate Commerce Commission authority over the physical operation of railroads equivalent to the power it now has over rates and financial practices and provides that trains in interstate commerce must be equipped with cars of steel or steeel underframe after a period of 10 years has elapsed. The Commission would have charge of the change from wooden to steel cars. The body also would be authorized to investigate all safety appliances. If this bill passes, how much authority will be left for the railroad officials? Is Mr. Stevens aiming at absolute control without ownership? Is it fair to attempt to control that which is not owned?

Reducing the Cost of Living

IN PITTSBURGH, in the very heart of the district which has been most benefited by the protective tariff, the humiliating spectacle is to be presented of the school children using "Made-in-Germany" lead pencils.

School children in Pittsburgh whittle up, wear out, chew up or carry home in the neighborhood of 4,000 gross of lead pencils each year. Last year, under protective tariff laws, an American manufacturer supplied these children with pencils for $7,000, or $1.75 a gross. A few weeks ago, this same pencil manufacturer, cognizant of the fact that a low tariff invited additional competition, offered to supply this lot of pencils for $5,760, or $1.44 a gross, a reduction of $1,240 on the entire order. A "Made-in-Germany" pencil was offered board members for $1.27 a gross, or $5,080 for the order, $680 lower than the 1914 bid of the American maker who employs parents of American school children.

It so happens that the fathers and mothers of Pittsburgh school children are represented in part on the board of education by men who are in a position to know something about the tariff. Taylor Allderdice, vice president of the National Tube Co., which has recently closed one of its plants in the Wheeling district and shut down several blast furnaces because of dullness in the pipe trade, is one of these members. There is not a man in Pittsburgh who has the interest of that city more at heart than has Mr. Allderdice. Another board member, also in a position to know how the dinner pail is affected by tariff legislation, is John Williams, a former puddler, now president of the Amalgamated Association of Iron, Steel and Tin Workers of North America.

Mr. Williams recently was re-elected president of the Amalgamated Association chiefly because of his ability, assisted by past high-tariff prosperity, to get puddlers a rate of $7 a ton for puddling iron, one of the highest scales ever obtained for this art. Mr. Williams presented a motion to throw out the bids on pencils; Mr. Allderdice supported it. So did some other members, but the board decided to buy the "Made-in-Germany" pencils.

And this is at Pittsburgh, where thousands of fathers of school children have been working only part time, if at all, the last few months.

Perhaps some of the children, while their fathers are idle, will use German pencils to write essays telling how the cost of living has been reduced by the low tariff.

Years ago, congress paid John Fritz $15,000 for reporting on a government armor plate plant and we doubt seriously whether much new light will be thrown on the subject by the newly authorized investigation. Members of congress should have read the Fritz report before authorizing the expenditure of any more money for investigations.

Public Servants in Unions

SAMUEL GOMPERS has invaded Ohio, and on Sunday made a speech at Cleveland, attacking the Board of Education of that city on account of its opposition to teachers becoming members of a union affiliated with the American Federation of Labor. At the Gompers meeting, it was announced that teachers throughout the state would be organized into unions. The question whether the board can decline to employ teachers because

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they are members of a union is to be tested in the courts, and possibly it will be shown that teachers have the legal right to affiliate with the hod carriers' union, the bartenders' union and any other old union. But who, having the interests of the schools at heart, would like to see them do so? If school teachers are to be members of unions, why not policemen and firemen? Are we coming to the day when public servants shall be allowed to consult labor agitators before discharging their duties? This would be rather inconvenient in the case of a fire and certainly humiliating in the case of school teachers.

Relative Ore and Pig Iron Prices

RELATIVE prices of pig iron and Lake Superior iron ore suggest an interesting subject for discussion whenever new ore prices are announced. In THE IRON TRADE REVIEW issue of May 7 was published, as had been done for a number of years, a chart showing price fluctuations in iron ore, Bessemer and foundry pig iron since 1889. For some purposes, an even more interesting comparison can be made by taking ore and basic pig iron at valley furnaces. This was done in an editorial published in THE IRON TRADE REVIEW of Nov. 28, 1912, shortly after the date of the announcement of iron ore prices for 1913.

Mesabi non Bessemer ore is taken because it involves the largest tonnage of the four groups and because it is the principal ore used in making basic pig iron.

MESABI NON-BESSEMER ORE AND AVERAGE BASIC PIG IRON.

Date of Ore Announcement.	Ore Price.	Pig Iron in Period Preceding.
Dec. 5, 1905	$3.50	$15.03
Nov. 5, 1906	4.00	18.34
June 15, 1908	3.50	19.79
May 10, 1909	3.50	14.64
Dec. 24, 1909	4.00	15.85
April 21, 1911	3.50	14.47
March 20, 1912	2.85	12.70
Nov. 19, 1912	3.40	14.25
May 1, 1914	2.85	14.38

The announcement Dec. 5, 1905, of the prices for 1906 delivery was an advance of 50 cents. The average price of pig iron for the period beginning Feb. 1, 1905, when 1905 prices were announced, and Dec. 5, 1905, was $15.03. Iron started upward and the average from date of the announcement of Dec. 5, 1905, to that of Nov. 5, 1906, was $18.34, which was in harmony with the advance in ore. The next announcement, that of Nov. 5, 1906, indicated another advance of 50 cents and pig iron kept on advancing, so that the average prices for the period of Nov. 5, 1906, to June 15, 1908, was $19.79. At the time, however, when the price for 1908 was fixed, the price of basic pig iron, valley, was $15.25 and the outlook was not favorable. In the preceding February, the reaffirmation of the 1907 prices had been repudiated by the buyers and a reduction of 50 cents became necessary. Pig iron continued to decline and the average for the period ending May 10, 1909, when prices for that year were announced was $14.64. The schedule announced Dec. 24, 1909, provided for an advance of 50 cents. The average price of pig iron for the preceding period was $15.85, but the price at the time of the announcement of 1910 prices was $17. Again pig iron declined and the average for the period ending April 21, 1911, was $14.47. Then came the low prices announced March 20, 1912. The average price for the preceding period had been $12.70, but for the 11 months from March 20, 1912, until Nov. 19, 1912, the average price was $14.25. Thus, after the sharp reduction in the price of ore, pig iron was considerably higher for the period after the reduction than it was for the period preceding. At the time prices for 1913 were fixed on Nov. 19, 1912, the price of pig iron was $16.50. The average for the year 1913 was $14.63 and for the four months of this year, it was only $13.10. The average for the entire period from Nov. 19, 1912, to May 1, 1914, was $14.38.

The question now arises, What, judging from the experience of the past, will pig iron do? We believe that no conclusive answer can be obtained from the history of the ore trade. Pig iron prices are now down to cost at most plants and it is pretty safe to predict that there will be little, if any, more decline. Whether prices will advance, will depend entirely upon market conditions.

Prices Present and Past

Quotations on leading products today, average for last month, average for three months ago and average for June, 1913. Prices are those ruling in the largest percentage of sales at the dates named.

	Today's prices.	Average for May, 1914.	Average for March, 1914.	Average for June, 1913.
Bessemer pig iron, Pittsburgh..	$14.90	$14.90	$15.15	$17.26
Basic pig iron, Pittsburgh.....	13.90	13.90	13.96	15.46
No. 2 Fdy. pig iron, Pittsburgh	13.90	14.09	14.15	15.04
Northern No. 2 Fdy.. Chgo....	14.25	14.25	14.25	16.00
Lake Superior Charcoal, Chgo..	16.00	15.75	15.50	16.75
Malleable Bessemer, Chicago...	14.25	14.25	14.25	15.75
Southern No. 2, Birmingham...	10.50	10.50	10.50	10.70
Southern Ohio No. 2, Ironton.	13.50	13.50	13.50	14.70
Basic, eastern Pa.....	14.00	14.00	14.25	16.00
No. 2X Virginia furnace.....	12.75	12.75	12.75	13.75
No. 2X Foundry, Philadelphia.	14.75	15.00	15.00	16.25
Ferro manganese, Baltimore....	38.00	38.00	38.50	61.00
Bessemer billets, Pbgh. & Ygn.	20.00	20.00	21.00	26.50
Op. h'th billets, Pbgh. & Ygn..	20.00	20.00	21.00	26.50
Bess. sheet bars, Pbgh. & Ygn.	21.00	21.00	22.00	27.50
Op. h'th sh. bars, Pbgh. & Ygn.	21.00	21.00	22.00	27.50
Steel bars, Pittsburgh.....	1.12½	1.15	1.20	1.40
Iron bars, Philadelphia.....	1.20	1.22	1.25	1.52
Steel bars, Chicago.....	1.28	1.29	1.38	1.58
Tank plates, Chicago.....	1.28	1.29	1.38	1.63

	Today's prices.	Average for May, 1914.	Average for March, 1914.	Average for June, 1913.
Structural shapes, Chicago.....	$1.28	$1.29	$1.43	$1.63
Iron bars, Cleveland.....	1.20	1.25	1.30	1.65
Iron bars, Chgo. mill.....	1.10	1.10	1.57	1.55
Beams, Pittsburgh	1.25	1.25	1.30	1.60
Beams, Philadelphia	1.25	1.30	1.30	1.60
Tank plates, Pittsburgh.....	1.10	1.12½	1.20	1.45
Tank plates, Philadelphia.....	1.25	1.25	1.30	1.75
Sheets, blk., No. 28, Pittsburgh	1.87	1.87	1.95	2.28
Sheets, blue an., No. 10, Pbgh.	1.37	1.37	1.40	1.75
Sheets, galv., No. 28, Pbgh....	2.80	2.80	2.95	3.39
Wire nails, Pittsburgh.....	1.50	1.57	1.60	1.78
Connellsville fur. coke, contr...	1.85	2.00	2.00	2.25
Connellsville fdy. coke contr...	2.50	2.50	2.50	3.00
Heavy melting steel, Pbgh.....	12.00	12.00	12.00	13.06
Heavy melting steel, east'n Pa.	10.75	10.75	11.25	12.50
Heavy melting steel, Chgo.....	9.75	9.95	9.80	12.00
Heavy cast, eastern Pa.....	12.50	12.50	13.00	13.50
No. 1 wrought, eastern Pa.....	12.50	12.50	14.50	15.50
No. 1 wrought, Chgo.....	8.75	8.63	9.00	11.25
Rerolling rails, Chgo.....	11.25	11.25	11.25	14.00
Car wheels, Chgo.....	11.25	11.38	11.75	17.00

(For Additional Prices See Page 1024.)

Fair Pig Inquiry in New York

Where About 25,000 Tons Are Pending—Some Improvement in Demand for Foundry Iron at Pittsburgh

Inquiries aggregating at least 25,000 tons of foundry, basic and low phosphorus iron, exclusive of East River segment and export negotiations, are pending in the market at New York City and adjoining districts. The number of consumers figuring has been growing, but purchases have not been in the same proportion, as buyers are inclined to act deliberately. Prices appear to have settled so low that there is little further recession, although they are not firm. New inquiries to come out in the week are 1,000 tons of high silicon and the revival of an abandoned inquiry for 2,000 tons of foundry metal, both by Bridgeport, Conn., buyers; 1,000 tons of Nos. 1X and 2X for a Newark furnace manufacturer; 700 tons for a Brooklyn buyer; 600 tons for Connecticut delivery and similar lots on which third quarter and last half delivery is asked. In addition, several thousand tons of low phosphorus have been put out and about 5,000 tons of quiet inquiry is current. The week's sales include about 3,000 tons of Nos. 1X and 2 plain for the Session Mfg. Co., Bristol, Conn., last half, which went to eastern New York and central Pennsylvania producers at an average of slightly over $15, delivered. It develops that the recent buying of a Newark shop embraced 1,500 tons of No. 1X from a Buffalo maker at a reported price of $13, furnace, or $14.75, delivered, and 1,500 tons of No. 2 plain from a Lehigh Valley maker at about $14.25, delivered. The 60,000 tons of East River segment requirements still are suspended awaiting an award of the castings to the foundries. Some furnaces bidding on the iron for two years' delivery ask $1 advance for next year and a monthly advance for 1916, which if shipment extends over 12 months, would average about $1.50 advance for that period. For export, an inquiry for 4,000 American off-Bessemer for St. Petersburg remains open, and this may be followed by 4,000 additional. A sale of 4,000 special northern iron for European shipment has been made.

Spotted Market in East

Scattered buying of iron in the eastern Pennsylvania district foots up a slightly better tonnage, but there has been no conspicuous change in the attitude of most consumers, which remains listless and cautious. Prices are drifting with the market, and having dropped to very low levels, now manifest only slight concessions, though they are by no means strong. A Norristown, Pa., buyer closed for 1,500 tons of Nos. 3 and 2 plain, third quarter, from one Schuylkill and one Lehigh Valley maker at slightly under $14 and at about $14.25, delivered, respectively. A Kutztown, Pa., shop took 1,000 tons of No. 2X, third quarter, from two Lehigh Valley makers at $14.75 and slightly higher. Two cast iron pipe makers took 500 tons of forge each, around $14, delivered. The United States Cast Iron Pipe & Foundry Co. has been receiving propositions on tonnage lots of mixed grades from both northern and southern makers, but seeks to shade established prices. Whether it is successful or not, it is expected to be a more liberal buyer soon. A Philadelphia consumer has increased an inquiry to 700 tons of malleable for June-July delivery. Basic shows no further sales, but some tonnage for Bridgeport, Conn., is before eastern furnaces. Only light selling of low phosphorus continues. Prices are little changed on eastern Pennsylvania foundry at $14.75, Philadelphia, for No. 2X; at $12.75 to $13, furnace, for Virginia No. 2X; at $14, delivered eastern Pennsylvania, for basic, and at $21, Philadelphia, for low phosphorus. The Chester, Pa., furnace is

(*For complete prices see page* 1024.)

banking for repairs for a few days. Furnaces in the Buffalo territory report a total placement of about 12,000 tons for the week, with the inquiry about equal to that of a week ago. The absolute minimum on foundry iron of any grade is claimed to be $13. The schedule ranges from $13.50 to $13.75 on No. 1 foundry and $13 to $13.50 on No. 2X foundry to $13 flat on No. 3 foundry and gray forge, leaving a spread of but 75c between the minimum on the low grades and the maximum obtainable at the present time on the high silicon irons. Producers are inclined to waive silicon differentials. Concessions to buyers are being made in this form rather than by a definite reduction in price, but no placements are being made in the Buffalo district at less than $13.

Valley Foundry in Better Demand

Although no particularly large single tonnages are involved, sellers of foundry pig iron at Pittsburgh and in the valleys have received better inquiry the last few days. Negotiations involve about 5,000 tons, including 500 and 1,000-ton lots for prompt, third and fourth quarter shipment. Some of the leading sellers are refusing to shade $13.50, valley, for either foundry or malleable grades, but the former still is obtainable at $13.90, delivered Pittsburgh. Steel-making grades continue to mark time, average prices for May, based on sales of 1,000 tons or more, indicating that Bessemer and basic continue to be held at $14 and $13, valley, respectively, according to figures compiled by W. P. Snyder & Co. May averages are the same as those established in April. Compared with averages for May, 1913, Bessemer and basic show declines of $2.78 and $1.899, respectively. The Carnegie Steel Co. now is operating 30 out of its 58 blast furnaces.

Slow Buying at Cleveland

One Cleveland firm during the past few days sold about 5,000 tons of pig iron and reports a somewhat better feeling in the market. Another Cleveland firm has sold a fair tonnage of iron during the past few weeks at $13.50 valley, but more iron has been sold at from $13.00 to $13.25 valley, and the price on largest percentage of tonnage being sold now is $13.00 valley. The demand in the Cleveland district is extremely limited. The usual prices asked for the third quarter are the same as for the first half. Cleveland foundries are slow to buy for the last half, as considerable tonnages purchased for the first half will not be melted before that time. It would not be surprising, however, to see a fair buying movement under way about July 1. With the near approach of the second half, inquiry in all grades of pig iron is decidedly on the increase in the Chicago district. Sellers there estimate at least 30,000 tons are now under negotiation, of which considerable is for basic, but foundry and malleable are also well represented. These inquiries vary from small tonnages to several thousand tons. With less than a month of second quarter remaining, sales for immediate delivery are of limited size.

A much better sentiment pervades the market and while the inquiry is not expected to be closed at once, and some of it may drag along for several weeks, it seems probable a considerable buying movement will be started soon.

Quotations for third quarter or the entire last half are understood to be on a basis of $14.25, Chicago furnace, for No. 2 foundry, but iron for fourth quarter only is being held at 50 cents above this price. Considerable resistance is being made to efforts for lower quotations and so far it is not known that tonnages have been placed at less than $14.25.

Considerable inquiry for basic iron is evident from the vicinity of St. Louis, which usually draws its supplies from this district, but prices have been so low on some business already placed there that several makers here have withdrawn from that competition.

Southern iron is not active in this immediate vicinity, but prices are being held at $10.50 to $10.75, Birmingham, for No. 2 foundry, with some business being placed at the latter figure. Southern Ohio iron appears to be holding firmly at $13.50, Ironton, for No. 2 foundry and is generally considered less likely to shade quotations than almost any other district.

Although charcoal furnaces in Michigan are being blown out on account of considerable excess of iron in stocks, quotations on Lake Superior charcoal iron remain firm at $15.75 to $16.75, Chicago, for Nos. 1 to 6.

Little Improvement at Cincinnati

The inquiry of the Portsmouth Steel Co., Portsmouth, Ohio, which has been pending for several weeks, is still unclosed, although it is generally expected that this deal will be terminated at any time. At Cincinnati the Standard Sanitary Co. has closed for 500 tons of southern No. 3 foundry at $10 Birmingham. A melter in Chicago territory is inquiring for 3,000 tons of high silicon iron for second half shipment.

Demand for light tonnages is slightly better, but melters are continuing their policy of buying from hand to mouth with the market as uncertain as it is at the present time. The general report of dealers for May is very unsatisfactory as far as the tonnage sold is concerned.

Southern prices are from $10.50 to $11, Birmingham basis, for No. 2 foundry, with the lower price in the majority with both Alabama and Tennessee furnaces. Southern Ohio furnaces are holding at $13.50, Ironton basis, for No. 2 foundry and basic.

Birmingham Reports Improvements

At Birmingham the iron trade has shown a slight but nevertheless a distinct improvement during the last week. Furnace men are feeling reasonably optimistic, although they state there is still much more improvement needed. "The old man has been mighty sick," said one of the big operators, "and while we appreciate a little improvement in his condition, it is going to take considerable more before things get back to a normal state."

At Birmingham the prevailing quotation is $10.75 and $11 for No. 2, although some small deals have been made during the past week for $10.50. Local furnace men say that their sales have averaged a slight increase over the week previous and they are rather anticipating a continued but gradual improvement.

Inquiries for pig iron in the St. Louis market are confined to car lots. Prices on southern No. 2, Birmingham basis, are nominally $10.50 to $11. Northern quotations are unchanged from last week.

No Cut in Ferro-Silicon

Recent sales of resale lots of foreign 50 per cent ferro-silicon have caused the circulation of inaccurate reports that a sharp reduction of their schedules had been posted by foreign manufacturers. Representatives of leading European makers declare there has been no change in the schedule of $71 to $73, seaboard or Pittsburgh, depending upon the size of the lot. Carloads of the resale material recently have been done at $69, seaboard, or $4 under the official schedule. Only carload and 100-ton sales are being done in ferro-manganese. Prices appear staple $38, seaboard, for both German and English material.

Ferro Alloys Unchanged

Reports have been heard in the trade the last few days to the effect that 50 per cent ferro-silicon is showing weakness, and talk of lowering the $73 quotations for small lots is heard. Ferro-manganese continues quiet.

(*For complete prices see page* 1024.)

Sheet Prices Still Weak

But Decline Seems to Have Been Checked in Chicago District

Although no largely increased demand for steel sheets is apparent in Chicago and vicinity, the steady decline in prices which has been marked the past few weeks appears to have been checked, at least temporarily. In fact, prices had gone so low that makers of sheet-ware were almost willing to close their mills rather than sell further at present prices. Quotations now are 1.98c to 2.03c and 2.98c to 3.03c, Chicago mill, for No. 28 gage black and galvanized, but some business appears to be going at $1 per ton less than these minimums, especially on galvanized. However, shading of these prices appears to be somewhat less than has been the case recently and transactions are more nearly uniform than usual.

Quiet at Cincinnati

The sheet market has been very quiet in the Cincinnati district during the past week. Several mills report heavier specifications at the first part of the present week, but new business is unimproved. Large manufacturers in this district state that in their opinion the market is as low as it can go, and that mills will reduce their working forces before they will sell below present quotations. Reports from an adjoining district indicate that prices there are below those given for the Cincinnati district. Black sheets are a little stronger than galvanized. Black sheets No. 28 are given at from 1.90c to 2c, galvanized No. 28 at from 2.85c to 2.95c and blue annealed No. 10 at 1.55c, all Cincinnati basis.

Since the purchase of 8,000 tons of sheets by The Hydraulic Pressed Steel Co., Cleveland, to which reference was made in these columns last week, no important transactions have been reported in that city, where there is still considerable irregularity in prices.

Sheet Market Marks Time

Scarcely any change is noted in the steel sheet market in western Pennsylvania and eastern Ohio. Some makers say specifications the first two days of this week showed improvement in volume, but this is believed to be the result of accumulation caused by the holiday last Saturday. Leading makers are refusing to shade minimum quotations, but concessions continue to be offered in isolated cases. The American Sheet & Tin Plate Co. has renewed operations at its Leechburg plant, which had been idle several weeks. Nine of the 11 sheet mills at that plant are now active.

Quick delivery requirements of consumers represent practically the full sheet market in eastern Pennsylvania. Buyers are not placing contracts nor are makers desirous of encouraging them at present low prices. The range of the market at Philadelphia and vicinity remains 1.50c to 1.55c, or 1.35c to 1.40c for No. 10 gage blue annealed.

Light Iron Ore Shipments

About Half the Tonnage Moved Last Year— No Season Chartering

Ore shipments during May were 3,852,063 tons, as against 7,284,212 tons shipped during May, of last year, a decrease of 3,432,149 tons. Shipments to June 1 aggregate 4,121,749 tons, as against 8,150,599 tons to June 1, last year, a decrease of 4,028,850 tons. Ore is moving somewhat more freely, though all the vessels belonging to the shippers are not yet in commission. No season chartering has been done as yet, due to the fact that ore sales have been uncommonly light. The ore movement to July 1 will in all probability be between 7,000,000 and 8,000,000 tons below that of 1913. It will be necessary for the lake season from July on to be as active as it was last year to make the total movement amount to 40,000,000 tons.

Shipping Ore to Europe

Some of the shipments of Chilean iron ore, for which charters recently were made, by the Bethlehem Steel Co. between Cruz Grande and Philadelphia, it develops, will be diverted to Europe, where some sales of this ore have been made at a reported price of 11 cents per unit, delivered. The remainder of the tonnage of the three cargoes will come in at Philadelphia, as reported, and the first lot is expected to arrive in about a week. The shipments to this country will not come through the Panama canal at this time, since only barge lots now may be handled through that waterway, but in September it is expected steamships carrying this ore may follow that route. The Bethlehem Steel Co. is offering some of its Chilean ore in this country to steel makers for fix purposes, at 10 cents per unit, tidewater. Eastern ore buyers remain indifferent.

Pessimistic in the East

Representatives of Lake Superior iron ore companies who have called upon eastern furnace operators recently have received very little encouragement. The prevailing sentiment among eastern manufacturers is pessimistic. Some of them have enough ore on hand to run well into the fall with such capacity as it is probable they will operate, and they see no reason for making contracts for additional ore at the present time.

Little Buying of Billets in East

The dearth of new business in billets for eastern Pennsylvania makers is unchanged. Buyers seem to be enjoying fair consumption, however, and are taking out their contract steel fairly well, relatively speaking. The Philadelphia and vicinity market for rolling billets is $22.40, delivered, or $20, Pittsburgh.

Wire Rods Weaker at Pittsburgh

Following weakness displayed by finished wire products, Bessemer and open-hearth steel wire rods have declined about $1 a ton, and are now listed at $25, Pittsburgh, per gross ton, as against the previous nominal quotation of $26. The market for billets and sheet bars pegs along at its previous slow gait, although it is understood makers are considering at least one attractive inquiry for billets.

Conditions are very quiet at Ashland. Small orders are being received from time to time, but the aggregate tonnage is far below the capacity of mills. Wire rods are given as unchanged at $26.50, Ashland, and billets at $20.50, Ashland.

Tin Plate in Demand

Manufacturers of tin plate in the Pittsburgh district continue to operate plants at practically full capacity, and specifications have improved in volume the last few days. The Jones & Laughlin Steel Co. will add eight tin mills to its plant at Aliquippa, which now contains a battery of 24 mills. When completed, this mill will be the largest single tin plate plant in the country.

(*For complete prices see page* 1024.)

Still Sounding Market

On Steel Bars and Implement Makers Do Some Contracting

Steel bars have not lost strength in the Chicago market during the past week and the increased specifications apparent 10 days ago have continued, indicating the increased demand is something more than a mere spurt. Business is not yet approaching sufficient volume to cause prices to be raised and with railroads buying lightly and agricultural implement makers still absent from the market, the betterment is not as great as could be desired. Quotations remain at 1.28c to 1.33c, Chicago, but without strength.

Steel Bars Sag at Pittsburgh

Although leading western Pennsylvania manufacturers are refusing to shade 1.15c for steel bars, tonnage has been obtained at 1.12½c, and frequent reports of sales at 1.10c are heard. Manufacturers of agricultural implements are beginning to figure in the market, but it is feared none of them will take normal requirements.

Implement Buyer May Close

One implement buyer of steel bars in the Philadelphia district is expected to close soon for about 2,000 tons for July to July delivery. Other implement manufacturers in eastern Pennsylvania continue to sound the market informally. New bar business remains small, though there is a good demand for reinforcing bars in that territory. The Concrete Steel Co. is low bidder upon about 1,000 tons of reinforcing bars for Panama. In the absence of its being tried out thoroughly, the eastern market remains quotable at 1.30c, Philadelphia, or 1.15c, Pittsburgh.

Implement Makers Feel Market

Implement manufacturers of New York State have taken some preliminary moves toward negotiating for their steel bar needs for the year from July 1. No definite action on these contracts is expected immediately, however, as the buyers are disposed to await until they feel certain the market has touched its lowest point. Bar buyers about New York are not doing much at present except in reinforcing bars, for which there is considerable demand. Steel bars are quoted at 1.31c, New York, or 1.15c, Pittsburgh.

Railroads Demand Quiet Delivery

The Pennsylvania railroad has been placing some good-sized orders for mills for Altoona, and in each case bar iron with eastern Pennsylvania has made immediate delivery the important conditions in giving out the business. The instance is cited as showing how low stocks of material with the railroads have fallen due to recent abstenious buying. The price most commonly heard in the eastern market for iron bars is 1.20c, Philadelphia, but buyers now declare they can do 1.15c, Philadelphia, for the larger orders.

Bar iron continues to be nominally quoted at 1.30c by Pittsburgh makers, although material can be laid down at that center at less than the general asking price.

Implement Makers Buy

At Cleveland agricultural implement manufacturers are still sounding the market and there has been some contracting, but not for large tonnages or for long periods. On small tonnages 1.15c Pittsburgh is the prevailing price on soft bars; 1.12½c will be taken on desirable business and on re-rolled material, mills are quoting 1.10c at their plants. Bar iron is dull and the Empire mill is not running this week.

Iron Bars Are Steady.

Specifications continue to be more numerous in the Chicago market and makers of iron bars are continuing operations at slightly better gait. Orders are mostly for small tonnages and immediate delivery, as users are buying for current needs and usually ask that their orders be filled speedily. Indications point to renewed activity shortly and the leading maker of iron bars in this territory is planning to close down for the usual summer repair period during June in order to be ready for enlarged business, which is confidently expected during July. Bars are still obtainable at 1.10c to 1.12½c, Chicago, but shading of the minimum is believed to be less prevalent than was the case a short time ago.

Hoops, Bands and Ties Unchanged

There is no change in the market for hoops, bands or cotton ties. Manufacturers have made no attempt to establish prices for the latter product, and it is not probable any action will be taken until ties are needed in the south. Hoops and bands are named at 1.25c and 1.15c, Pittsburgh, respectively.

Lease is Extended.—The lease of the McIntyre Iron Co., upon the Cedar Point furnace at Port Henry, N. Y., where important experiments in the smelting of New York State titaniferous iron ores are being conducted, has been extended to cover the month of July. The original lease was for the six months ending June 30. The company now is carrying forward its tests with larger quantities of titaniferous ore in its mixtures.

Coke Weaker

Although Production Has Been Curtailed

Despite curtailed production, the Connellsville coke market has failed to hold its own, contract furnace coke being obtainable at $1.85, ovens. Some operators are standing by their guns for $2 a ton, and that figure continues to represent the top of the market. Spot furnace fuel is selling at $1.75, ovens. Foundry grades show weakness and price reductions probably will feature the market shortly. The *Connellsville Courier*, for the week ending May 23, says production was 257,630 tons, a decrease of 37,085 tons compared with the week before. Coke plants are operating at about 50 per cent capacity.

Foundry Demand Improves

At Cincinnati demand for foundry coke is increasing, due to the fact that a large number of yearly contracts will expire this month. The majority of transactions, however, are for light tonnages. Furnaces are buying from hand to mouth in a number of cases as prompt shipment coke can be had at lower figures than that for contract shipment. Wise county foundry coke is now given at from $2.25 to $2.75, ovens, and Pocahontas 72-hour grades at from $2.25 to $2.40, ovens, all these figures being slight reductions from those given last week. Other prices are unchanged.

The coke market at St. Louis took on a buying movement last week, with sales reported by one firm of 30,000 tons of 48-hour grades, 15,000 tons of foundry grades, to one car company, and 1,500 tons of foundry to another car company. The prices were not made public.

Wire Prices Sag

As had been expected for a couple of months, prices of wire products have declined to low levels prevailing the early part of the year, and the market at Pittsburgh now is quotable at $1.50, for nails, with $1.55 being the general asking price for future delivery. The market has developed greater activity in some sections, but refusal of consumers to buy over long periods has had a depressing effect.

(*For complete prices see page* 1024.)

Pennsy Offering Scrap

In Unusually Large Quantities in East—Old Material Market Still Drags

The Pennsylvania railroad is offering for prices an unusually large list of old material aggregating about 23,000 tons of various grades. This lot is more than double that offered monthly by this system and represents accumulations in some grades of several months. The appearance of this list is the only matter of interest in the eastern Pennsylvania scrap market. Sales still run light and are scattered. Prices drag and car wheels and wrought pipe are quoted lower.

No Life at New York

The old material market at New York City continues largely stagnant. New buying is small and for light tonnages. The steel works are out of the market and some of them are holding up shipments on orders closed some time ago at $11.50, delivered, or considerably above the present market. There is some shipping of borings and turnings from the east into the Pittsburgh territory, where prices for these grades are more attractive.

Marking Time at Buffalo

Consumers and dealers alike in the Buffalo district continue to hold to a waiting attitude. That's the surface indication. There are, however, some dealers who are quietly engaging in considerable buying of lots here and there, for the purpose of turning the stocks obtained to profit on the anticipated strengthening of the market, looked forward to at an early date, with the settlement of the railroad rate case before the Interstate Commerce Commission. Consumers' stocks are reported to be low and the expected demand will, in the belief of these dealers, cause a stiffening of prices.

The principal local user is again in the market for moderate tonnages of heavy melting steel. A slight softening in prices developed Tuesday afternoon in No. 1 railroad and machine cast scrap, from $11.50 to $12, to $11 to $11.50; in old iron axles, from $21.50 to $22, to $20.50 to $21.50; in car wheels a drop of 50c, quoted now at $11 to $11.50; and a decline of 25c in railroad malleable scrap, listed now at $10 to $10.50.

Scrap Nominal at Pittsburgh

Quiet continues to prevail in the market for old materials at Pittsburgh, and quotations for most grades are nominal. Heavy melting steel is being sold at $12, and some dealers have obtained $12.25 for desirable tonnages the last 10 days. The Pennsylvania railroad is asking bids on material at its several shops in western Pennsylvania.

Firm at Cleveland

Prices are holding fairly firm in the Cleveland market for iron and steel scrap, but business continues light. Prices are unchanged, and, as a rule, nominal. Rolling mill business is extremely dull, shipments being refused at all mills in the district. One consumer of heavy melting steel continues to accept shipments of one or two cars a week from each dealer with whom he has contracts, but is buying little. The other leading consumer offers $10 gross ton for melting scrap, a price considered prohibitive by dealers generally. Foundry business is about stagnant; cast scrap is in no demand. Dealers generally are extremely gloomy, although here and there may be found those who consider a buying movement as impending.

Only One Bright Spot

In Cincinnati, a slight demand for heavy melting steel has developed during the past few days, which is the only bright spot in the iron and steel scrap market in that city. This material is being held at from $8.25 to $8.75 per net ton, f. o. b. dealers' yards. With this exception, the market is very quiet and in most cases prices are weak. It is frequently stated by both dealers and users that the present dull period has far exceeded that of any previous one, both as to lack of sales and to the time intervening between important transactions.

Chicago Scrap Unchanged.

No change has taken place in the scrap market in Chicago. Quotations are almost nominal, with practically no tonnage being bought or sold. Two railroad lists now before the market total about 3,000 tons. The Chicago & North Western offers 5,500 tons, of which 1,500 tons are steel rails and the Great Northern offers 2,400 tons.

Scrap lists out for closing this week are 2,500 tons by the Missouri Pacific Railroad Co., and 1,700 tons by the Frisco railroad. The steel mills continue to ask for limited supplies of scrap, but all other lines are dull. Prices are unchanged from last week.

Creditors Get Dividend. — A final dividend of 3 per cent has been ordered paid to the creditors of the Diamond State Steel Co., Wilmington, Del., by the United States district court. This dividend makes a total of 67 per cent, which has been distributed to the stockholders, and 23 per cent to the general creditors. The total amount of the claims were $1,204,680.

Plate Market

Shows More Strength at Chicago—Dull in East

Some increase in car buying and the prospect of placing orders now pending have had effect of stiffening to some degree the Chicago plate market. From being the weakest factor in finished steel, plates have come now to stand alongside bars and shapes and appear to have lost some of the weakness that characterized them previously. No large business is being taken, but sufficient tonnage is coming out in smaller lots to make an appreciable difference and the effect has been to hold prices more firmly to 1.28 to 1.33c Chicago, than had been the case.

At Cincinnati, the market is dragging along at 1.40c, Cincinnati basis, for sheared plates, which quotation has held for about three weeks. Sales are few and for small tonnages. Conditions as a whole are unfavorable, but show an inclination to improve in the near future.

Pittsburgh Plates Still 1.10c

Observance of a holiday last week has resulted in slightly heavier specifications, but it is not believed orders will continue to come in at the rate maintained Monday and Tuesday. Steel plates are listed at 1.10c at Pittsburgh, and that figure represents the top of the market except when small tonnages are involved.

Buffalo mills and agencies indicate the coming in of a number of orders for moderate tonnages of plates. The demand has been noticeable in the past 10 days. Placements are being made at 1.15c, base. While there is some talk of better than 1.15c, base, being obtainable, no booking is reported at less than the schedule quoted.

Plates Slow In East

No improvement is shown in the eastern Pennsylvania plate market. The mills are operating at better than half capacity on a wide assortment of orders, usually small. Very little boat steel now is coming out from eastern shipyards. Eastern makers still quote 1.30c, Philadelphia, or 1.15c, Pittsburgh, on carloads, but 1.25c, Philadelphia, is being done on larger orders. The Worth Bros. Co. is low bidder on the plates for two oil barges to be built by the government

(*For complete prices see page* 1024.)

at Mare Island and the Jones & Laughlin Steel Co. on the shapes. About 500 tons are involved.

Orders Light at New York

No plate tonnage of especial size or importance is being offered in the New York market at this stage. Orders run small and are light in the total. Prices at New York City are unchanged at 1.26c to 1.31c, or 1.10c to 1.15c, Pittsburgh.

Soft Prices

On Cast Iron Pipe in Eastern Territory

Soft prices characterize the eastern cast iron pipe market and the volume of new requirements is of only medium size. There continues a fair buying by the private trade, but public lettings, while of considerable number, are unusually small. Some very low prices for large pipe, which dipped considerably below $18, at the foundry, have appeared recently in this territory. The Warren Foundry & Machine Co. has taken 500 tons of 36-inch for Fall River, Mass., and also has an order for 1,600 tons of 30-inch for San Diego, Cal. Bids are in this week on 350 for Stamford, Conn., 200 tons, for Cambridge, Mass., and 150 tons for South Orange, N. J.

Cast Pipe Is Slow

Last week proved unusually slow for sellers of cast iron pipe in the Chicago market and practically nothing was closed during that period. A tonnage of water pipe at Regina, Sask., Canada, was awarded to the Canadian Iron Works at Fort William. Bids will be opened June 5 at Springfield, O., on 100 tons and on June 9 at Salt Lake City on 1,500 tons. Contractors' orders continue to be received in considerable volume, which makes up the bulk of the current business.

Warehouse Business

At Chicago, warehouse business is seeing a decided increase and dealers there expect the present month to show a considerable advance over previous months this year. Prices are holding firmly and in the face of renewed buying, declines are not looked for.

With building operations somewhat interfered with by the strike of brick makers, demand for steel for construction work is less than normal, but stocks are moving at a better rate than had been expected.

At Cincinnati, warehouse business is slightly better and gives indications of continuing so throughout the week. Demand is mostly for structurals and twisted concrete reinforcing bars, the latter having been brought out by the large amount of concrete construction work going on in this city at the present time. Prices are unchanged and dealers with one accord state that the reduction in quotations which was predicted some time ago will not occur.

At Cleveland, warehouse business drags with little, if any, improvement during May, as compared with April.

Shape Mills

Receiving More Inquiries at Pittsburgh —Few Contracts

Structural mills in the Pittsburgh district are receiving numerous inquiries, and orders are being placed more frequently than a few weeks ago. Prices show no improvement and talk of material going at 1.10c is heard. No particularly large contracts have been taken by Pittsburgh fabricators, but it is understood contracts for the new William Penn hotel soon will be placed.

Pending in Cleveland

The Cleveland Railway Co. which recently received bids for the repair shops which it expects to build on Harvard street, calling for 1,500 tons of shapes and bars, has decided to re-figure the contract and again call for bids. Roderick D. Grant was the lowest bidder. The county commissioners will advertise at an early date for bids on the Brooklyn-Brighton bridge, a concrete structure, which will call for 1,200 tons of reinforcing bars. Bids have been received on the repairs for the Central Viaduct, damaged by the recent fire in the flats. About 600 tons of steel will be required. It is expected that the successful general contractor will soon be decided upon by the city officials.

Bids will be taken soon for the new Woman's building of the University of Cincinnati, which will be erected on the campus in Burnett Woods, Cincinnati. The estimated cost will be $125,000. A. Lincoln Fecheimer, architect, and Walter Franz, consulting engineer, both of Cincinnati, are in charge of construction.

Better Demand For Shapes

Along with other finished steel products in Chicago, structural shapes have felt to a greater degree the effect of a somewhat quickened demand. Structural work appears to be going forward with greater strength than was the case earlier in the spring and specifications and orders have increased considerably in the past fortnight. While no large tonnages are pending, there is sufficient volume of small enterprises to make a much better total than has been booked for sometime past. Prices appear to be checked on their downward movement and are holding steadily at 1.28c to 1.33c, Chicago, which appears to be practically the bottom of the market.

Large Hotel to be Built

At St. Louis announcement has been made by August A. Busch, president of the Anheuser-Busch Brewing Association, that a 16-story steel frame, fireproof hotel, to cost approximately $2,500,000, will be built on Twelfth street, between Market and Chestnut streets, that city, as soon as plans can be drawn. The hotel will be called the Adolphus in honor of Mr. Busch's father, the late Adolphus Busch. The formal transfer of the site will be made in a few days.

Philadelphia Work Light

Only a light tonnage of new structural work is being offered at Philadelphia and southeastern points. Apart from a bridge letting of 2,000 tons across the Schuylkill river by the Pennsylvania railroad, there are few new requirements of size. An award of 1,500 tons for a second eastern Pennsylvania coal breaker is reported and more of this character of work is in sight. Eastern mills are running at 50 to 60 per cent of capacity and their tonnage in the main is from old contracts. The plain shape market remains 1.25c to 1.30c, Philadelphia, or 1.10c to 1.15c, Pittsburgh. Fabricating prices are being cut sharply.

Steel Contracts Placed

Seven-span bridge for Pennsylvania railroad over Schuylkill river at Earnest, Pa., about 2,000 tons, placed with Phoenix Bridge Co.

Much Small Work at Metropolis

The structural market at New York at present embraces many small orders and inquiries, but the larger tonnages are scattered and the aggregate tonnage is not up to what would be expected at this time of the year. Loft construction in New York City is much behind the season. Lettings of the week total about 8,000 tons. Bids were taken at New York this week on the 15,000-ton bridge for the Chesapeake & Ohio railroad across the Ohio river at Portsmouth. The New York plain material market remains 1.26c to 1.31c, delivered, or 1.10c to 1.15c, Pittsburgh, but it usually requires an order of some attraction to bring out the lower figure.

CONTRACTS AWARDED.

Northern Pacific Ry. Co., viaduct over Green river, King Co., state of Washington, 2,450 tons, to American Bridge Co.

Houston & Brazoria Valley Ry. Co., and county of Brazoria, one 290-foot draw span and two 125-foot spans, between Freeport

(*For complete prices see page* 1024.)

and Velasco, Tex., 498 tons, to the Virginia Bridge & Iron Co.

Chicago Rock Island Ry. Co., five 39-foot I-beam spans, 218 tons, to the Chicago Bridge & Iron Co.

High school, Germantown, Pa., 500 tons, Awarded to the American Bridge Co.

Towle building, Boston, 500 tons, awarded to the Boston Bridge Works.

Car barns for the Easton Light & Fuel Co., Easton, Pa., 1,500 tons, awarded to independent fabricators.

Loft building for the Alan Realty Co., Thirty-seventh street, New York City, 1,000 tons, awarded to Hunkle Iron Works.

Addition to the State House, Boston, 800 tons, awarded to the New England Structural Co.

Hotel, Holyoke, Mass., 500 tons, awarded to the American Bridge Co.

Astor apartment, on Broadway between Eighty-ninth and Ninetieth streets, New York City, 2,500 tons, understood to have gone to Hinkle Iron Works. This contract originally was reported to have gone to Levering & Gerrigues.

Koppers by-product coke plant for Bethlehem Steel Co., South Bethlehem, Pa., 2,000 tons or more awarded to the Eastern Steel Co.

Alerton apartment, West Thirty-eighth street, New York City, 500 to 600 tons, awarded the Heddon Iron Construction Co.

Y. M. C. A. building, East Third street, New York City, 450 tons, awarded to an independent shop.

Loft building 15 West Forty-fourth street, New York City, 450 tons, awarded to the Heddon Iron Construction Co.

Bridge at Lancaster, N. H., for Boston & Maine railroad, 200 tons, awarded to the Boston Bridge Works.

Day Nursery, Ignatius Hospital, East Eighty-fourth street, New York City, 200 tons, awarded to Levering & Gerrigues.

Building for Borden Condensed Milk Co., Bronx, New York City, awarded to the Communipaw Steel Co.

CONTRACTS PENDING.

Wm. Bingham, warehouse, Cleveland, 1,200 tons shapes, 2,000 tons bars; will be awarded June 6.

Repairs to the Central viaduct, Cleveland, 600 tons. The general contract will soon be awarded.

Shops for the Cleveland Railway Co., 1,500 tons; new bids will be called for.

Brooklyn-Brighton bridge, 1,200 tons of reinforcing bars; commissioners will soon advertise for bids.

Commonwealth pier, Boston, 500 tons. Bids asked.

Station for the New York, New Haven & Hartford railroad at Pawtucket, R. I., 800 tons. Bids being taken.

Factory for the National Casket Co., Long Island City, 400 tons. Bids being taken.

Highway lift bridge over the Passaic river in New Jersey, 400 tons. Bids being taken.

Power house, New Haven, Conn., 300 tons. Bids being taken.

Nine buildings for Catskill aqueduct at Catskill, N. Y., 300 tons. Bids being taken.

Motordome for Sheepshead Bay, New York City, estimated to require at least 4,000 tons. Plans being prepared.

Cheseborough building, State and Whitehall streets, New York City, 2,000 tons. Bids entered. Bethlehem sections specified.

Park building, Worcester, Mass., 500 to 1,000 tons. Bids being taken.

Addition to Hotel Traymore, Atlantic City, 800 to 1,000 tons of steel column cores. Plans being prepared.

Power house, Tampa, Fla., 200 tons. Virginia Bridge & Iron Co.low bidder.

Increased Rail Buying

Orders Are More Numerous and Outlook Improves—Few Cars Bought

New York, June 3. (By wire.)—There is an appearance of better inquiry for forward delivery and there is some improvement in actual orders both by the United States Steel Corporation and leading independents. The past few days have strengthened the more hopeful tone of makers. The low stage of stacks causes some expectation that a quick change may result.

Unfilled orders of the Corporation for May, however, will show further falling off, about the same as for April.

The American Bridge Co. has placed 30,000 tons of steel with makers in the Chicago district. New structural inquiry is better, that of the past week reaching 32,000 tons.

The American Bridge Co. has 2,500 tons for Northern Pacific viaduct over Greene river.

Developments of the past week in the rail market have been for the better, both in orders and prospects. The Pennsylvania railroad, having finally determined the cost of the test lot of rails recently rolled under its proposed new specifications, found this too heavy and now has modified its original proposal. Prices are being asked of the mills upon the revised specifications and it is believed the placing of the system's full order for the season will follow soon.

Rail orders of the week include 17,000 tons for the Seaboard Air Line, 2,600 tons of running rails for the Interborough Rapid Transit Co., New York City, 2,500 tons for the Cuban railway, 2,400 tons for the Cumberland Valley railroad and 1,500 tons for the Northwestern Pacific. The New Haven recently placed about 9,000 tons with two eastern mills. The Seaboard Air Line is inquiring for 6,000 kegs of standard spikes. Total rail orders for May were heavier than during April and March and were about 110,000 tons, including 40,000 tons for export. In April the total orders were 60,000 tons and in March about 61,500 tons.

Car orders with builders in May totaled only about 6,000, which was as small as any similar period this year. In addition 1,000 to 2,000 cars were placed with railroad shops. Total car orders this year both with private builders and railroad shops reach approximately 50,000. The only order of importance placed the past week was 750 hoppers for the Delaware, Lackawanna & Western railroad. The Illinois Central still holds off on the purchase of 3,000 box cars.

The Cleveland, Cincinnati, Chicago & St. Louis railroad, with headquarters in Cincinnati, has been given authority by the Ohio State Public Utilities Commission to issue $5,600,000 equipment trust certificates and $2,000,000 notes to buy new equipment, which will include 2,500 steel coal cars and 4,500 steel frame box cars.

CAR AND LOCOMOTIVE ORDERS.

The Delaware, Lackawanna & Western railroad has ordered 400 hopper cars from the American Car & Foundry Co. and 350 hopper cars from the Cambria Steel Co.

The St. Louis, Brownsville & Mexico railroad has placed 20 consolidation locomotives with the Baldwin Locomotive Works.

The Northwestern Iron Co. has bought one switching locomotive from the Baldwin Locomotive Works.

The Public Belt Railroad Commission of New Orleans, has placed two switching locomotives with the Baldwin Locomotive Works.

The McCloud River Railroad has ordered one Mikado type locomotive from the Baldwin Locomotive Works.

The Rutland railroad has ordered one superheater six-wheel switching locomotive from the American Locomotive Co.

The Charlotte Harbor & Northern railroad has ordered 30 phosphate cars from the Pressed Steel Car Co.

The Minneapolis Traction Co. is inquiring for 60 flat cars and 15 passenger cars.

The Stewart Iron Co. is in the market for eight gondolas.

The Aurora, Elgin & Chicago railroad is figuring on 10 gondolas.

The San Antonio & Aransas Pass railroad is inquiring for 50 flat cars.

The Solvay Process Co. is in the market for five hopper cars.

RAIL ORDERS AND INQUIRIES.

The Seaboard Air Line has placed 17,000 tons of rails of which 5,000 tons went to the Maryland Steel Co. and the balance to the Tennessee Coal, Iron & Railroad Co.

The New Haven railroad recently placed a partial rail order for this year's delivery about 9,000 tons, which was equally divided between the Bethlehem Steel Co. and the Pennsylvania Steel Co.

The Cuban Railway Co. has ordered 2,500 tons of rails of the Lackawanna Steel Co.

The Interborough Rapid Transit Co., New York City, has placed 1,300 tons of running rails with the Lackawanna Steel Co. and 1,300 tons with the Bethlehem Steel Co. and still is in the market for about 2,500 tons of contract rails.

The Queensland railroad, Australia, has ordered 17,000 tons of 42-pound rails and 13,000 tons of 60-pound rails for the United States Steel Products Co. This order was included in the recent report of 35,000 tons having been taken by the Exports company from British Colonies.

The Cumberland Valley railroad has ordered 2,400 tons of rails, of the Pennsylvania Steel Co.

The Puget Sound Traction & Heat Co. has ordered 500 girder rails of the Pennsylvania Steel Co.

(*For complete prices see page* 1024.)

Production of Pig Iron Declines

Blast Furnace Output During May is 165,000 Tons Less Than in April—Fourteen Fewer Stacks Active at Close of Month

The effect of the large number of blast furnaces blowing out in the last week of April is shown clearly by the figures for production of anthracite and coke pig iron in May. The output declined 164,908 tons, production in May being 2,096,593 tons, compared with 2,261,501 tons in April.

The output, as well as the number of stacks in blast, compares closely with conditions during January and with the exception of December, 1913, and the first two months of this year, is the lowest since January, 1912. The net loss of 14 in active stacks makes a total of 34 blast furnaces going out of blast in the last two months, as April showed a net decline of 20.

MONTHLY PRODUCTION.

	1914.	1913.	1912.
January	1,879,336	2,787,800	2,052,806
February	1,888,607	2,578,670	2,098,796
March	2,341,551	2,762,823	2,411,529
April	2,261,501	2,754,353	2,377,621
May	2,096,593	2,816,825	2,503,341
June	.....	2,616,883	2,433,737
July	.....	2,558,275	2,402,567
August	.....	2,537,018	2,500,163
September	.....	2,494,098	2,444,454
October	.....	2,539,924	2,683,645
November	.....	2,229,960	2,639,562
December	.....	1,976,138	2,777,292
Totals	10,467,588	30,652,767	29,325,513

The average daily output in May was 67,632 tons against 75,383 tons in April, a loss of 7,751 tons. Declining activities of the steel works or non-merchant furnaces was responsible largely for this loss. The average production of steel-making iron in May was 46,869 tons, compared with 54,308 tons in April, a loss of 7,439 tons. The merchant furnaces averaged 20,068 tons daily during May and 20,326 tons during April, a loss last month of only 258 tons.

AVERAGE DAILY PRODUCTION.

	1914.	1913.	1912.
January	60,624	89,929	66,220
February	67,450	92,095	72,372
March	75,534	89,123	77,791
April	75,383	91,812	79,254
May	67,632	90,865	80,753
June	.....	87,229	81,125
July	.....	82,525	77,502
August	.....	81,839	80,650
September	.....	83,137	81,482
October	.....	81,933	86,569
November	.....	74,322	87,985
December	.....	63,746	89,590

The total production of the steel works furnaces in May was 1,452,967 tons against 1,629,234 tons in April, a loss of 176,267 tons. Merchant furnaces produced 622,122 tons in May and 609,783 tons in April, a gain last month of 12,339 tons. Five merchant furnaces were blown out in May and one was relighted, a net loss of four. Twelve steel works furnaces were blown out and two blown in, a net loss of 10. In all, 17 furnaces were put out of blast and three were relighted, a net loss of 14. There were 198 stacks active on May 31, compared with 212 on the last day of April.

The production of ferro in May was 16,180 tons, against 17,400 tons in April, a loss of 1,220 tons. The output of spiegel in May was 5,324 tons, compared with 5,084 tons in April, a gain of 240 tons.

The merchant furnaces blown out in May were: Detroit "B", Detroit Iron & Steel Co., 15th; Susquehanna No. 3, Rogers-Brown Iron Co., 7th; Cleveland No. 2, Cleveland Furnace Co., 17th, for re-lining; Wellston No. 1, Wellston Steel & Iron Co., 8th, and Mayville "A", Northwestern Iron Co., 15th.

MAY PIG IRON

States.	No. of stacks.	No. in blast last day of month. May.	April.	Total tonnage made. Merchant.	Non-Merchant.	Totals— May.	April.
Pennsylvania	157	78	83	153,916	674,970	828,886	937,978
Ohio	73	42	47	129,631	361,061	490,692	531,274
Alabama	45	18	18	117,044	35,011	152,055	142,985
Virginia	22	7	7	27,073	.....	27,073	24,461
New York	26	14	15	82,935	58,371	141,306	141,047
New Jersey	7	2	2	10,880	.....	10,880	10,868
Illinois	26	13	14	31,859	149,820	181,679	185,828
Colorado	6	2	2				
Indiana	10	8	8				
Maryland	4	2	2				
Wisconsin	6	3	4	24,275	166,547	190,822	191,879
Kentucky	7	2	2				
West Virginia	4	1	1				
Tennessee	18	4	4				
Washington	1	0	0	24,469	7,187	31,656	49,667
Georgia	2	0	0				
Texas	3	0	0				
Minnesota	1	1	1				
Michigan	3	1	2				
Missouri	1	0	0	20,040	.....	20,040	23,030
Spiegel—All states...						5,324	5,084
Ferro—All states....						16,180	17,400
Totals	422	198	212	622,122	1,452,967	2,096,593	2,261,501

Corrigan, McKinney & Co. re-lighted their Genesee stack on May 6.

The steel works furnaces blown out included South Works No. 3, Illinois Steel Co., 15th; Harriet "Y", Wickwire Steel Co., 26th; one Central and one Donora, the American Steel & Wire Co.; one Ohio, one Duquesne, one New Castle and one Farrell, of the Carnegie Steel Co.; La Balle No. 1, La Belle Iron Works, 11th; Haselton No. 2, Republic Iron & Steel Co., 16th, for re-lining; Steelton No. 2, Pennsylvania Steel Co., 23d, and Midland No. 2, Pittsburgh Crucible Steel Co. The non-merchant furnaces relighted were Mattie, of the Girard Iron Co., and Cambria No. 5, of the Cambria Steel Co.

Distilling Plants.—The American Tar Products Co., Chicago, has placed contracts for three tar distilling plants to be erected at Youngstown, O., St. Louis, Mo., and Birmingham, Ala. The H. Koppers Co. received the contracts.

Made New York Agent

Phillip E. Wright, who for 17 years has represented the Thomas Iron Co. in the sale of its brands of pig iron, in Philadelphia and surrounding territory and is known widely in the eastern iron field, also has been appointed sales agent for the company in the New York territory, succeeding W. P. Chamberlain. The change was effective June 4. Mr. Wright now will cover the sales in both the Philadelphia and New York territories for the Thomas Iron Co. The New York office of the company will remain at No. 622, 90 West street.

The Ford Publishing Co., Cincinnati, has been incorporated with a capital stock of $200,000, to publish an encyclopedia covering all phases of engineering. The work will be scientific in character and each subject will be prepared by well known engineers in different fields of engineering. James T. Ford, of the Bourbon Brass & Copper Works, originated the idea of such a publication and has been elected president of the new company.

The Oxweld-Acetylene Co., Newark, N. J., is erecting an extension to its plant.

More Definite Indications

Of Improvement in Iron and Steel in England—Orders More Freely Placed

Office of The Iron Trade Review,
Prince's Chambers, Corporation St.,
Birmingham, Eng., May 23.

This week's meetings of the iron and steel trade have shown more definite signs of improvement than have been observable for some months. The Black Country forges and mills have booked a good deal of material during the past week, especially from merchants and warehousemen, who have gradually arrived at the conclusion that the slump has about spent itself. Within the last few days 500 tons were placed on these lines with a Black Country firm by a large Birmingham merchant. He was able to buy very favorably, but it is very doubtful whether he would have found a maker to have accepted his offer if that offer had been made a week later. Here and there Black Country mills have commenced work on Monday morning instead of Monday night. As a rule, purchases are still in small quantities for urgent needs; but they make a much better total than for some time past. There has, however, been a further slight easing in prices of unmarked bars. For marked bars recent figures are very well maintained, and mills are quite well off for work. It is not without significance that the Yorkshire Bar Iron Makers' Association have recently decided to maintain their basis price of £7 5s 0d ($35.46).

The weakest iron department in Birmingham and South Staffordshire is that of gas strip.

The cable from THE IRON TRADE REVIEW announcing heavier basic pig iron buying and an improvement in sentiment was very welcome, especially as it coincided with an intimation from the continent that the recent cutting quotations for billets and bars are peremptorily withdrawn. This is taken as meaning that under extreme financial pressure, the Belgians have been sending their stuff over here at an actual loss, and that this ruinous policy cannot be continued. This withdrawal would be a great relief to English makers. At the present time, steel ship plates are still reaching Glasgow from the continent at £5 12s 6d ($27.54), which is much below what home makers can produce. The association steelmakers recently agreed to reduce their export prices for ship and boiler plates by 10s ($2.44) per ton, and the same policy has now been applied to the steel sold to British buyers. The British mills are fairly well off for work.

More Interest in Pig Iron

The steadiness of the pig iron market continues, with here and there signs of keener interest on the part of consumers. There are signs of improvement, especially in the hematite trade of Barrow, owing to an increased business in engineering and shipbuilding. The present quotation at Cleveland, 51s 3d ($12.54), is substantially what it was a week ago, although there have been one or two fluctuations in the meantime. With warrant stores now standing at 90,000 tons, these have now ceased to have any speculative value, and as the tendency of stocks is still downward, the reduction this month being 5,000 tons, makers will be able to take full advantage of the recovery whenever it arrives. A noticeable feature on the Midland market is the great urgency of consumers for all material on order.

The belief is growing that the position of the furnaces is gradually strengthening, and it seems likely that within the next few days inquiries for material will increase. There has been a further improvement in the demand for foundry iron, owing to a revival in engineering. The latter trade has, in fact, never really fluctuated to the same extent as that of finished iron and steel. The Birmingham meeting yesterday showed a decidedly improved tone, which was fully shared in the raw material department.

German Iron Trade

Berlin, May 21.—During April, the premier heavy industry of this country was not able to regain any of the ground lost since the outbreak of the Balkan war. On the contrary, there are indications that it has made a further retrograde movement. The output of pig iron has gone on and has even been increased by the starting of some new furnaces on the part of one or two of the big concerns in western Germany. At the same time, the pig iron syndicate finds that it can with difficulty dispose of 80 per cent of the full producing capacity of its members. Half-products are as depressed as ever they were, and under competition between the big and small works, their prices are falling to figures that were thought to be impossible a few years ago. The competition is in some quarters supposed to be coming chiefly from Belgium, France and other foreign countries; but it is much more the result of the extraordinary extensions which have been made in the domestic producing capacity of the mills; that is the cause of the present unsatisfactory state of things. Prices of bars have been forced down to 92 marks ($21.62) per ton in western Germany, and for export to 82 marks ($19.27), f. o. b. Antwerp. Hoop iron is selling at 115 marks ($27.02½) for best brands and down to 110 marks ($25.85) for less favored marks. Sheets are offered at 115 marks to 116 marks ($27.02½ to $27.26) for the best makes and down to 110 marks to 112 marks ($25.85 to $26.32) for other sorts; for export, plates are obtainable at 95 marks ($22.32½) and sheets at 100 marks ($23.50). The wire and wire products market is disturbed by the disruption of the wire syndicate. Wire nails are offering at 12.50 marks ($2.93¼) per keg. Heavy structural steel is comparatively in a much better position; orders on hand are still fairly large, and prices are unchanged for rails, but some anxiety is beginning to be felt over the persistence with which the state railway department insists on a reduction in the prices for orders to be placed for the next fiscal year. Light and pit rails are doing fairly well at 115 marks for the home market and 97.50 marks ($22.90¾) for export. Tram rails for export are quoted 115 to 125 marks ($27.02½ to $29.37½).

While reports about the course of the iron trade in this country are very conflicting there is one thing about which the various authorities are fairly agreed—the growing intensity of competition for orders, and as a result general price-cutting, both among the works at home and with foreign engineering concerns.

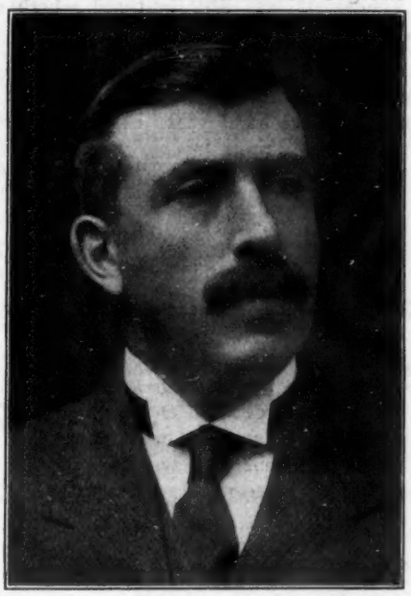
Vice President Sheadle

J. H. Sheadle, who for a number of years has held the title of secretary of the Cleveland-Cliffs Iron Co., was elected vice president of that company at a recent meeting of the board of directors. S. Livingston Mather was elected secretary. Of late years, Mr. Sheadle's activities in this large organization have covered a very wide range, including ore sales and lake transportation, while he has become one of the foremost figures identified with the problems affecting lake traffic in general.

MEN OF THE IRON TRADE

Who they are Where they are What they are doing

John B. Clark, recently elected a member of the American Iron and Steel Institute, has had a long and successful record in the steel business. He was a farmer's boy and was educated in the public schools. He started in the steel business with the Lackawanna Iron & Steel Co., Scranton, Pa., in 1881 in the Bessemer department, and was soon advanced to first ladle man. In 1883 he was one of four engaged to start the Bessemer Steel Works of the Worcester Steel Co., Worcester, Mass. In 1890 he entered the service of the Belleville Steel Co., of Belleville, Ill., as a Bessemer steel blower and later was advanced to foreman and superintendent of the Bessemer department. In 1895 he entered the employ of the Johnson Co., Lorain, O., as Bessemer steel blower and was advanced to foreman. In September, 1901, he was appointed superintendent of the Bessemer Steel Works, Algoma Steel Co.,



JOHN B. CLARK,
New Member American Iron and Steel Institute

Sault Ste. Marie, Ontario, Can., and successfully started that department on Feb. 18, 1902. In March, 1904, he was engaged by the American Steel & Wire Co., as superintendent of the Bessemer department and blooming mills of the Schoenberger works, Pittsburgh. Later he was transferred to the Newburg Steel Works of that company in the same capacity. In June, 1909, he was appointed general superintendent of the Schoenberger Works, and recently was appointed general superintendent of the Donora Steel Works of the American Steel & Wire Co.

George W. Forney, formerly identified with the Pickands-Magee Co., Pittsburgh, is now sales manager for the Poland Coal Co., that city.

William K. Paff has been named secretary and treasurer of the New Jersey Wire Cloth Co., a subsidiary of the John A. Roebling's Sons Co. These positions were formerly held by the late United States Senator Frank O. Briggs. Mr. Paff became head of the company's Philadelphia department 20 years ago.

John P. Frey, editor of *The Iron Molders' Journal*, with offices in Cincinnati, delivered his third lecture before the class of commerce and administration, of the University of Chicago, on May 24. Mr. Frey's subject was "Relation of Scientific Management to Labor." He will deliver two more lectures before the same class in the near future.

Col. George Pope, of the Pope Mfg. Co., Hartford, Conn., was re-elected president of the National Association of Manufacturers, at the closing session, May 21, of its annual convention at the Waldorf-Astoria, in New York. The other officers re-elected were Geo. S. Boudinot, New York City, secretary; J. B. Bird, New York City, general manager; A. B. See, of the A. B. See Electric Co., Jersey City, treasurer. A vice president was elected for each state.

John Wood Jr., founder of the John Wood Mfg. Co., Conshohocken, Pa., is a member of the Wood family so prominently identified with the iron and steel industry in eastern Pennsylvania for several generations. He is the grandson of the enterprising Quaker, James Wood, who, in 1818 rolled the first steel sheets in this country, and he is the son of John Wood, former United States congressman from Pennsylvania. John Wood Jr., about 1901, after considerable experimenting, succeeded in adapting the electric incandescent method of welding to the manufacture of boilers and tanks on a commercial scale. He utilized a machine which had a capacity for turning out from 350 to 500 pieces of finished work a day. By this method, boilers designed for working pressure of 125 pounds per square inch, underwent successfully a test pressure as high as 1,200 pounds in some cases. Since 1901, a large business has been developed around this process and the plant at Conshohocken now is working night and day, turning out about 1,500 cylinders and tanks daily. Mr. Wood, a few years

JOHN WOOD JR.,
Prominent in Eastern Iron and Steel Industry

ago, retired from the more active direction of the concern, being succeeded as president by his nephew, Victor Mauck. Mr. Wood still makes his home at his handsome residence in Conshohocken, but has his business office at 1420 Chestnut street, Philadelphia, the headquarters of John Wood Jr., & Co.

Fields E. McMillen, of Pueblo, Colo., has been chosen president of the Mammoth Iron Co., Pueblo, operating the Indian Creek placer in Saguache county, Colo., on the Denver & Rio Grande. C. D. Hillabolt was elected to the board of directors. Will J. Orange is secretary and James F. Drake, treasurer. The company has contracted to furnish the Colorado Fuel & Iron Co. from 300 to 1,000 tons of ore per day for 10 years. It is laying out a model town at Buxton switch near its property.

Armor Plate Provision

Is Finally Carried After Being Knocked Out Twice in Congress

Washington, June 2.—After being defeated in the House and temporarily balked in the Senate, supporters of the plan for the government to build its own armor plate plant won a victory this afternoon in the Senate, when the naval appropriation bill was again taken up.

An amendment, drawn up by the Navy Department, and submitted by Senator Thornton, of Louisiana, was adopted. It authorizes a committee of three to report at the next session on a site for and the cost of a plant with capacities of 20,000 and 10,000 tons annually. The committee is to consist of one member each from the House and Senate naval affairs committees, to be named by their chairmen, and a naval officer, to be selected by the Secretary of the Navy Daniels.

The new amendment, adopted by viva voce vote, was a revival of one originally incorporated in the bill directing the secretary of the navy to make an investigation as to a location for and cost of an armor plate plant. This amendment was killed in the House upon a point of order being raised by Minority Leader Mann, who contended it was general legislation. It was restored by the senate committee and again killed when Senator Oliver, of Pennsylvania, was sustained in his point that it was general legislation. An amendment submitted some days ago by Senator Ashurst, of Arizona, appropriating $4,000,000 for the erection of an armor plate plant, was killed when a point of order was raised by Senator Bryan, of Florida.

Senator Oliver raised a point of order against the new amendment also, but President Marshall held that it was not general legislation. Senator Thornton explained that the amendment had been prepared by the Navy Department with the hope of meeting the point raised by Senator Oliver. The amendment appropriates $5,000 to cover the expenses of the investigation committee, which is authorized to sit during the recess of Congress "to send for persons and papers and to administer oaths."

Some sharp discussion was made over a letter submitted by Senator Oliver and written by Attorney Samuel Dixon, pronounced by the senator to be one of the "most eminent Democrats of Pennsylvania and the nestor of the Philadelphia bar". Mr. Dixon referred to his disgust with the present Democratic administration and to "the crass ignorance of the secretary of the navy and his supporters in the Senate."

Upon motion of Senator Thomas, of Colorado, the personal and objectionable features of the letter were stricken out with the approval of Senator Oliver, who said he had not noticed those features. He said they did not express his views, but on the contrary, he had the highest regard for the secretary of the navy personally and "his supporters in the Senate".

Attorney Dixon scored the plan for the government to build its own armor plate plant. He said it would cost nearer $10,000,000 than $5,000,000 to build it, and he demanded to know what good it would do to build the plant when no provision had been made to make steel and plates. It would, he said, cost the government two or three times as much to make armor plate as it would cost to have it made by private manufacture.

Gary Cheers President

Who Says Conditions in United States Are Better Than in Any Other Country

Washington, June 2.—President Wilson feels confident that further improvement in the iron and steel industry is near at hand. In his semi-weekly conference yesterday with newspaper correspondents, he expressed himself along that line. Much encouragement was derived by him, it was explained, from recent statements made by Judge E. H. Gary, chairman of the United States Steel Corporation.

It is the president's belief, it was inferred, that whatever business depression exists is a "state of mind" — psychological, as he last week told Ohio and Illinois manufacturers who called upon him in a vain endeavor to have anti-trust legislation postponed. The president dismisses from the slightest consideration suggestions that the tariff law has anything to do with what depression prevails.

Influence of Railroads

The railroad situation, it was made known, was, in the president's estimation, the only one which has any excuse for permitting the "state of mind" to continue. The radiation of the railroad view of things had, of course, affected kindred industries, especially steel, it was indicated, although he had noticed Judge Gary's remarks and gained the belief that the steel business is picking up and that prospects look better. The business depression is world-wide, it was pointed out, and has been of an international character for a long time. Conditions in the United States were declared to be far better than in any other country in the world. Confidence was expressed that better things are on the way, and that if business men will change their viewpoint there will be a speedy improvement.

The president again declined to commit himself as to whether he thinks the Interstate Commerce Commission should grant an increase in freight rates, but, as in the past, he admitted that the weak spot in the country's business is among the railroads. It was not indicated whether the president thought the railroad view of things was mental or real, his remarks as to a "state of mind" applying more particularly to manufacturing and other lines of business.

Immunity from prosecution under the Sherman law is not granted labor unions by amendments prepared for the Clayton anti-trust bill, in the estimation of the President. One of these amendments, providing that no labor or farmers' organization shall be held to be a combination in restraint of trade, passed the House yesterday without a single dissenting vote. Democrats, Republicans and Progressives scrambled madly to go on record, through speeches, as "friends of labor." Of the 208 members in the House when the vote was cast, 207 voted for the amendment. Charmes M. Thompson, Chicago Progressive, did not vote. The other amendment legalizing picketing and prohibiting injunctions in the case of strikes, except when loss of property is threatened, was adopted today.

It is the president's belief that the labor amendments merely define clearly the status of labor, and wipe out reason for the claim of labor unions that they exist only by sufferance of the Department of Justice. But at the same time, it was stated, the organizations would not be given any more right to violate the law than any other class of men.

Righteous Conquest of Markets

In Foreign Lands Favored by President Wilson, Who Greets President Farrell and Other Manufacturers—National Foreign Convention

Washington, June 3.—President James A. Farrell of the United States Steel Corporation told a representative of THE IRON TRADE REVIEW that there was not the slightest doubt that good results will follow the National Foreign Trade Convention, held in Washington last Wednesday and Thursday. It was the first gathering of exporters of the United States, but will be perpetuated, arrangements to that effect having been made.

Mr. Farrell, along with other great industrial heads, including among others such men as President E. A. S. Clarke of the Lackawanna Steel Co., and President Alba B. Johnson of the Baldwin Locomotive Works, who was made permanent chairman of the convention, took a lively interest throughout the meeting. For their efforts to further the oversea trade of American producers they were thanked generously by delegates of the convention, and while at the White House greeting President Wilson, he told them that "There is nothing in which I am more interested than the fullest development of the trade of this country and its righteous conquest of foreign markets."

"I think," he added, "that you will realize from what Mr. Redfield has said to you that it is one of the things that we hold nearest to our heart, that the government and you should co-operate in the most intimate manner in accomplishing our common object."

The president's brief talk was in reply to a statement by Mr. Johnson, who expressed a complete confidence in the desire of the administration to promote legitimate foreign trade. Mr. Johnson touched upon the opportunities which will be afforded by the opening of the Panama Canal, of the reconstruction and rearrangement of trade relationships which must result from the completion of that waterway, of the enactment of the new tariff law, "which will, we hope, open a door outward for our exports to the same extent that it opens inward for the imports of foreign countries."

President Farrell, being head of the delegation, was the first to shake hands with the President, being presented by Edward N. Hurley, president of the Illinois Manufacturers' Association.

Resolutions, all of them unanimously adopted, were presented to the convention just before it came to an end. They provide for the establishment of a foreign trade council of 30 members; reorganization of the Bureau of Foreign and Domestic Commerce, Department of Commerce, and the establishment of commercial attaches and commercial agents in connection with the consular service; exemption of United States exporters from the operation of the anti-trust law; negotiation of reciprocity treaties, accurate census of manufacturers; placing the diplomatic and consular service of a higher plane; upbuilding of an American merchant marine, a matter to which President Wilson pledged personal support. Numerous delegates expressed themselves as being pleased at the address delivered at the banquet by Secretary of State Bryan. He said the state department would favor honest loans and honest business enterprises in foreign countries, each matter to be dealt with separately as it arose. The department would not, however, back up by force or the menace of force, loans or enterprises which were not legitimate.

Several months ago, before the American Asiastic Association of New York, Secretary Bryan repudiated "dollar diplomacy" flatly, it was contended, and his views of last week were therefore taken as a step in advance of his previous address. He took pains to tell the convention that the good offices and agencies of the department would be utilized for the building up of foreign trade. Mr. Farrell was among those who voiced satisfaction at the principles enunciated by Mr. Bryan.

The convention throughout was characterized by an air of dispassionateness, hopefulness of the future, and the belief that co-operation between the American makers, and the national administration, bringing about a clearer understanding, would be of great advantage. Of the three dozen or more papers read, with discussions following most of them, criticism of legislation or policies of the government was remarkably slight, and that which was voiced was done in a spirit of sincerity. In a word, it was constructive, and, with the immense interests back of those represented at the convention, it was felt heed would be given to any suggestions they might offer to increase their foreign business.

World is Watching

(FROM PRES. FARRELL'S ADDRESS.)

The commercial world is watching our consular service and the efforts of our government to keep this most important branch of our foreign representation on a merit and business basis. They will not forget that this service remains the one organized expression of our country in the stupendous economic contests which are now engaging the nations of the world in competition. The commercial interests of the United States should support and fortify in every possible manner the splendid work of the Secretary of Commerce, and other departments of the government, in their efforts to maintain and improve this branch of our government service.

In the struggle for the trade of the world, the United States will occupy the place for which the bountiful resources of nature and the efficiency of the people have equipped her. The intelligence, enterprise, and co-operation of the people and government will be applied to maintain and strengthen her position.

Meissner Honored

On the occasion of the 50th anniversary of the School of Mines, Columbia University, May 29, Carl A. Meissner, among others, had conferred on him the honorary degree of Master of Science in recognition of his services in the manufacture of iron and steel.

Mr. Meissner is chairman of the coke and blast furnace committees of the United States Steel Corporation.

The W. M. Pattison Supply Co., Cleveland, dealing in hardware, metal making machinery, railroad and mill supplies, has increased its capital stock from $150,000 to $500,000, preparatory to the erection of a salesroom and warehouse on Rockwell avenue, N. E., between Sixth and Ninth streets. The plot is 80 x 165 feet. The present salesroom is on St. Clair avenue, a four-story warehouse on East Fortieth street and a storage yard at East Thirty-third street and Hamilton avenue, N. E.

The M. Rumely Co. and the Rumely Products Co., Inc., have moved their Chicago offices to the 14th floor of the Michigan Boulevard building, Michigan boulevard and Washington street.

Tariff Reduction Blamed

For Stagnation in This Country—Convention of Boiler Makers

Tariff reduction lies at the root of the present stagnation of business, and if this be carried to its limits, manufacturers of the United States will have no alternative but to cut wages and to sink them to the low European levels, declared Samuel D. Vauclain, vice president of the Baldwin Locomotive Works, in an address delivered at the banquet of the annual convention of the Master Boiler Makers' Association and the Boiler Makers' Supply Men's Association, at the Hotel Walton, Philadelphia, Thursday evening, May 28. Mr. Vauclain, who has made a special study of labor conditions abroad, stated that the average weekly wage of boiler works in France was $6.20, while in the Baldwin works the weekly average was $15.50. The French product is just as well made as the American, he said. Six months ago, Mr. Vauclain said, the Baldwin works had 18,500 men on its payroll. At present 12,000 of these are looking for jobs. Addresses also were made by C. L. Huston, of the Lukens Iron & Steel Co., and by D. J. Champion, of the Champion Rivet Co., Cleveland.

At the annual business sessions, John C. Campbell, of the Chicago Pneumatic Tool Co., Chicago, was made president of the Supply Men's Association; D. J. Champion, of the Champion Rivet Co., Cleveland, vice president, and George Slate, of *The Boiler Maker,* New York City, secretary and treasurer. The executive committee consists of W. O. Dudley, president of the Chicago Pneumatic Tool Co., as chairman; W. H. S. Bateman of the Champion Rivet Co. and Parkesburg Iron Co., Philadelphia; George Seavy, of the Otis Steel Co., Cleveland; G. W. Faessler, of the J. Faessler Mfg. Co., Moberly, Mo.; B. F. D. Stafford, of the Flannery Bolt Co., Pittsburgh, and George Slate, of *The Boiler Maker,* New York City The Master Boiler Makers' Association elected Jas. B. Johnston, of the Santa Fe System, Los Angeles, president; Andrew Greene, of the Big Four railroad, Indianapolis, first vice president; D. A. Lucas, of the Burlington railroad, Havelock, Neb., second vice president; John B. Tate, Pennsylvania railroad, Altoona, third vice president; Chas. P. Patrick, Erie railroad, Cleveland, fourth vice president; Thomas Lewis, of the Lehigh Valley railroad, Sayre, Pa., fifth vice president; Harry D. Vought, New York City, secretary; Frank Gray, of the Chicago & Alton railroad, Bloomington, Ill., treasurer. The supply men adopted a resolution urging that every effort be made to amalgamate the various boiler men's supply associations into one national organization.

An interesting feature of the convention was the trip on Wednesday of the delegates to Coatesville and Parkesburg, Pa., where the plants of the Lukens Iron & Steel Co. and the Parkesburg Iron Co. were inspected. The trip was made by special train, which was provided by the Parkesburg Iron Co. The first stop was made at Parkesburg, where the guests were escorted through the works of the Parkesburg Iron Co. and saw the manufacture of boiler tubes in all its stages. The special then proceeded to Coatesville, where a sumptuous luncheon provided by the Lukens company, was enjoyed and the operation of rolling boiler plate was witnessed. About 500 made the trip.

In appreciation of his efforts as chairman of the general committee of arrangements, in providing comfort and entertainment for those in attendance, W. H. S. Bateman, of the Parkesburg Iron Co. and the Champion Rivet Co., Philadelphia, was presented a diamond ring and a silver loving cup, by the boiler makers' and supply men's associations, respectively. Mrs. Bateman was similarly remembered by the ladies of the party and of the local reception committee, with gifts of a gold friendship pin and a silver dish.

Mills Returns to Cleveland

Pittsburgh, June 3. (By wire.)—James R. Mills, manager of sales in New Orleans of the Carnegie Steel Co., yesterday was appointed to succeed the late John R. Scott, of the Cleveland office. Stillman Wheelock, manager of sales at St. Louis, has been appointed Mr. Mills' successor. Mr. Mills was for several years in charge of the Cleveland office.

Renews Contract

Pittsburgh, June 3. (By wire.)—A consumer of billets in this district has renewed a contract for billets covering a long period of years to one of the mills in this territory. The sale has no direct effect upon the present market, inasmuch as prices will be fixed from time to time. The billet and sheet market continues quiet, and prevailing prices are nominal.

An order for 2,600 tons of oil country goods has been placed with a manufacturer in the Pittsburgh district for shipment to Ohio.

Twenty Years

Is Term of Important New Contract for Metal

Pittsburgh, June 3. (By wire.)—The Bollinger-Andrews Construction Co., which now operates a large plant near Verona, Pa., a short distance from Pittsburgh, has closed a contract with the Josephine Furnace & Coke Co., a subsidiary of Corrigan, McKinney & Co., Cleveland, whereby the latter will furnish the former hot and cold pig iron metal for a period of 20 years. Corrigan, McKinney & Co. will furnish a site of 20 acres next to its blast furnace plant at Josephine, Indiana county, Pa., on which the Bollinger-Andrews company will erect buildings covering from six to eight acres. Ingot molds and heavy mill castings will be manufactured. When operating at full capacity, the new plant will require from 350 to 400 tons of Bessemer pig iron a day, which insures continuous operation for one of the two Josephine stacks during the term of the contract.

This is one of the most important contracts closed for this district for some years. Metal will be bought at valley prices based on average prices printed in THE IRON TRADE REVIEW. Work on the new plant will begin within the next 60 days.

The Bollinger-Andrews company will abandon its plant at Verona, moving its equipment to Josephine. The new plant will be treble the size of the present works and will be modernly equipped throughout. The Bollinger-Andrews company will enjoy the advantage of $1 in freight on molds used in Pennsylvania and the east. G. L. Bollinger is president and T. L. Andrews is vice president of the Bollinger-Andrews Construction Co.

Carrying Ore on Norway's Hills

How an Aerial Cableway and Loading Plant is Arranged to Handle a Low Grade Product

AUTOMATIC loading and conveying plants, which will work efficiently in heavy snow in winter, are necessary in the iron ore mining districts of Norway. Among the many interesting installations of this sort is one recently erected at Bogen by Adolf Bleichert & Co., Leipzig-Gohlis, Germany, for the Westfjord Iron Ore Co. Two Bleichert wire ropeways for carrying raw ore and loading the finished concentrates in the harbor at Bogen Fjord have been installed. The ore is obtained in open workings and conveyed by means of inclined planes to the loading hoppers of the first cableway, which carries the material over the crest of a hill to the hoppers of the dressing plant, some 4,000 feet away. The loading point on the ropeway is about 660 feet above the discharge station, the capacity amounting to 50 tons of ore per hour in the direction of the dressing plant and 30 tons back to the loading station on the mountain. In consequence of the return traffic on the ropeway, an automatic system is impracticable and a drive of about 25 horsepower is required.

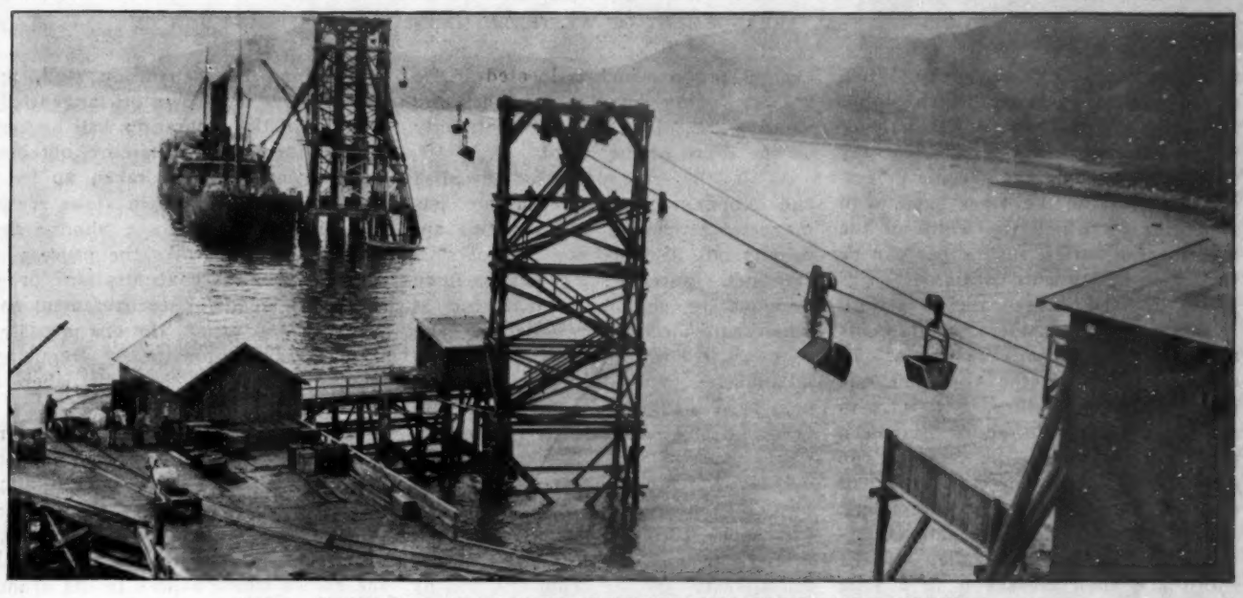


FIG. 1—LOADING A BOAT WITH IRON ORE AT BOGEN FJORD, NORWAY

Fig. 4 gives a view of the loading station at the mines. The large hoppers for raw ore may be seen at the left. The standing ropes of the cableway, which are steel, are carried by timber supports resting on concrete foundations. The trolleys run over these ropes, as on rails, and are hauled by an undertype traction rope, which is guided round a driving sheave in the end station. This system, the so-called bi-cable ropeway, is said to have many advantages compared with the English mono-cable, which is sometimes used for smaller capacities and short distances. The English system has one single moving rope, which draws the cars over the line.

On the bi-cable system, the carrying ropes can be constructed of strong rigid wires, so that the track is both durable and substantial, while the traction rope is composed of light and flexible thin wires, producing a minimum of frictional resistance on the driving sheaves in the stations. The carrying ropes can, therefore, be arranged to take large spans, the feed line of the Westfjord Iron Ore Co., Ltd., having, for example, a span of over 2,200 feet. The carrying ropes are anchored at one end of the line and tensioned at the other end by suspended tension weights, which compensate for any overloading of the line, and provide an assurance that the rope tension, determined when the system is constructed, will be maintained, but not exceeded. The individual buckets are suspended from trolleys consisting of two cast steel wheels carried in a suitable steel frame. They are fitted with the Bleichert coupling apparatus designed for under-type rope, which acts automatically. The cars, on running into the stations, open a clip and release the traction rope, which is raised by means of rollers, so that it is lifted clear of the apparatus. When leaving the stations, the cars are merely pushed to the exit by the workmen, when the clips open automatically and grip the traction rope.

The trolleys hang firmly on the traction throughout the trip, without working loose even on the heaviest gradients. This gripping apparatus is said to have proved successful on one of the steepest lines in the world, namely the large wire ropeway in the Usambara Mountains in German West Africa, which has a gradient of about 5,000 feet in a distance of about 5½ miles. Heavy wire ropeway for handling timber in Bosnia and Servia, which carry individual loads of three or four tons, are also equipped with this apparatus. The apparatus not only works automatically, but has also a large clip, opening so that it will take traction ropes of varying diameter with equal safety. This is very important, more especially on the line for the Westfjord Iron Ore Co., Ltd., as the cars of one line can also run on the other line, in spite of the fact that traction ropes of different diameters are used.

Often the traction ropes stretch in course of time, so that a piece must be taken out and a splice inserted. A traction rope which has stretched will, however, have a smaller diameter than originally, and the gripping apparatus would consequently have to be carefully adjusted, if it were

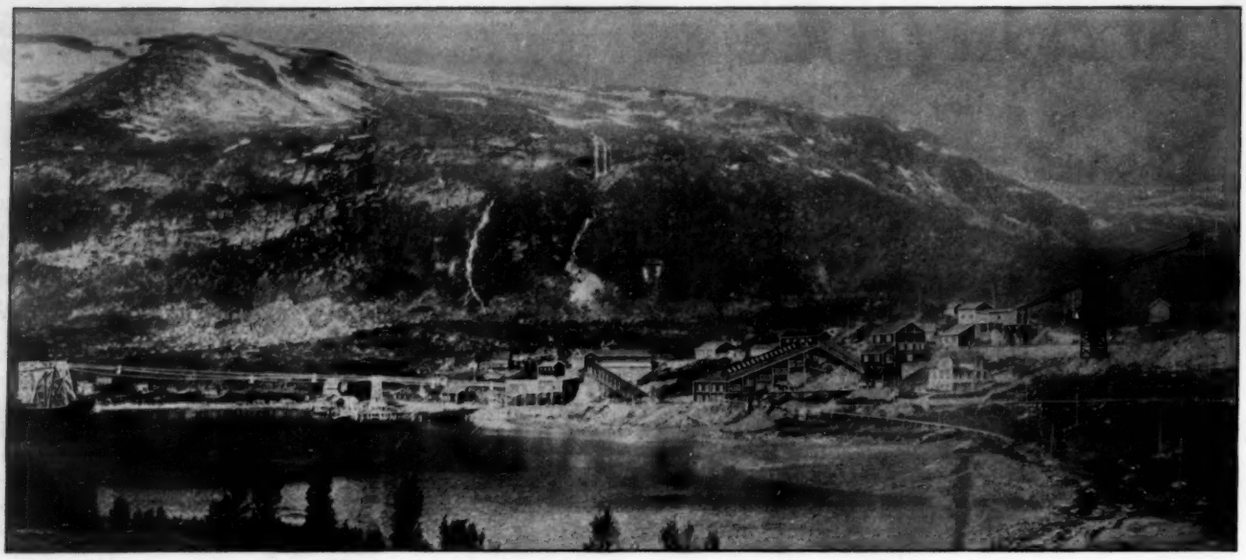


FIG. 2—GENERAL ARRANGEMENT OF WESTFJORD IRON ORE CO.'S PLANT

unable to grip the thinner rope. When using gripping apparatus which cannot accommodate itself to the diameter of the traction rope, it is necessary to lay aside a rope which has become defective in places; on the other hand, with apparatus on which the width of the jaw opening varies, such ropes can be used with safety until worn out.

On the feed line of the Westfjord Iron Ore Co. considerable gradients and sharp bends will be found. In order to preserve the ropes at one point, a timber gantry, Fig. 3, with extra long carrying shoes has been provided, over which the cars can run conveniently with the assistance of elevated traction rope carrying idlers. From this point the line falls somewhat abruptly to the valley of the Fjord and then crosses it in a long span of 2,200 feet, Fig. 5, to the discharge station, which is located at the highest point in the concentrating plant. The plant itself lies directly on the shore of the Fjord.

As is the case in most Swedish and Norwegian mines, the ore has magnetic properties and contains approximately 25 to 30 per cent of iron. It must, therefore, be concentrated previous to shipment. The ore is taken from the hoppers under the wire ropeway to large crushers, in which it is subjected to a preliminary breaking up. It is then carried on a belt conveyor to smaller crushers for further treatment. From the latter it is taken up by a small belt conveyor and passed round a drum, in the interior of which strong electro-magnets are fitted. While the pieces containing ore are attracted by the drum and fall by their own weight into a special receptacle behind the separation wall, the barren stone is thrown off tangentially in front of the separation wall by centrifugal force. The richer ore, obtained in this way, is again taken up by a belt conveyor, broken in stone crushers and subjected to a similar dry magnetic process. As the process of separation and concentration progresses, by means of wet treatment and magnetic separation, the ore is passed through an automatically regulated feeding device into the mills, where it is finely ground.

Water is passed into the drums simultaneously with the ore with the object of forcing the slimes over rotating magnetic separation tubes, the residues flowing away with the water through a special channel to the sea, while the slimes which adhere to the drums, are sprayed with water and submit-

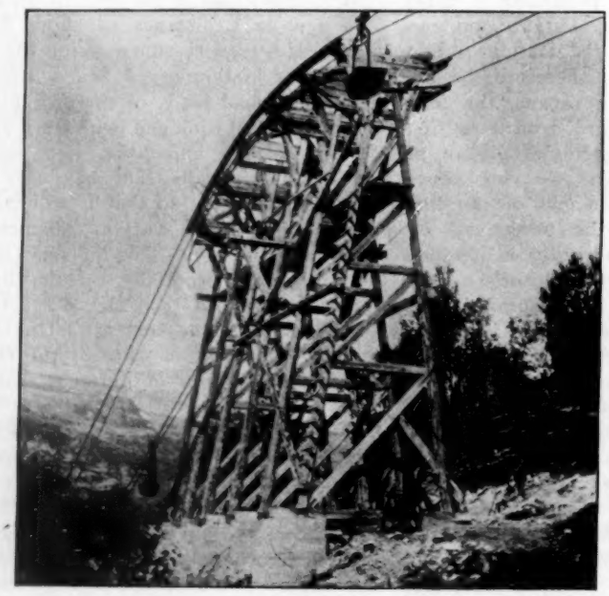


FIG. 3—ANCHOR TOWER AT TOP OF HEAVY GRADE

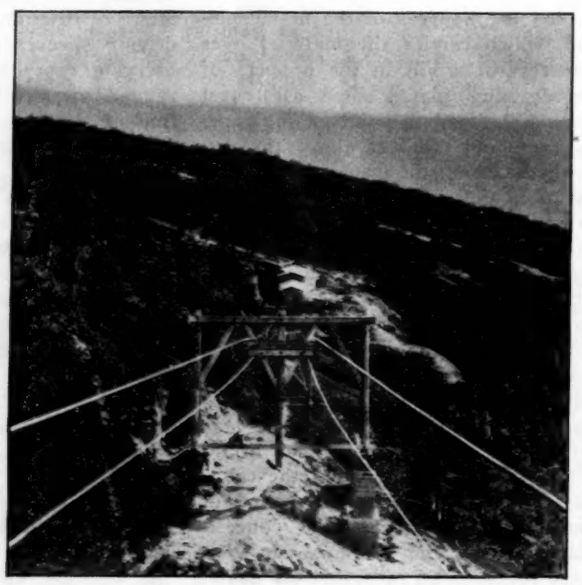


FIG. 4—LOADING PLANT AT THE MINE

ted again to two similar processes. The concentrates then pass into settling tanks which are periodically agitated by a mechanical appliance, whereby the dead rock still adhering to the slime is disengaged and swept away by the continual flowing of the water.

The heavy slimes fall to the bottom of the settling tanks, from which they are periodically dumped into cars standing underneath. The cars are hauled to the so-called slig-house, by means of an electric winch. The latter holds about 8,000 tons of concentrated ore, and is built throughout of re-inforced concrete. It is fitted with draining channels, so that the water in the ore can run off, and in this way the amount of water is reduced from 10 to 6 per cent. In this condition the ore is ready for shipment. The walls of the slig-house are heated in winter, in order to prevent the slig from freezing. A series of outlets are provided in the bottom of the ore hoppers, under which the transport belts run. The ore is shoveled through these onto the belts, which carry it to the loading line, which leads out to the support in deep water.

Loading the Steamers

Fig. 2 shows the whole dressing plant, with the feed ropeway on the right as it passes to the crusher house over a high support at the end of the 2,200-foot span. The crushing houses and mill adjoin. From the mill building, a large main conduit is laid to the shore of the Fjord, where the dead rock is deposited. In the center of the illustration will be noticed the second magnetic dressing plant with the ore hopper and loading ropeway, which may be seen leading to the steamship at the left of the picture.

FIG. 5—LONG SPAN IN CABLEWAY

This type of loading ropeway is also frequently used as a substitute for a dock, for the purpose of handling freight between ships and the shore over a shallow or rocky coast line. Similar devices are often to be seen, for instance, on the extensive ore beds in Spain and on the Island of Elba. The reason for this is obvious; plants of this kind are not only much cheaper than a solid pier, but have also the advantage that their employment does not increase the danger of silt filling up the harbor. The working of a wire ropeway is also much simpler and cheaper than a railway constructed on a fixed loading bridge.

The ore steamers which receive the products of the Westfjord Iron Ore

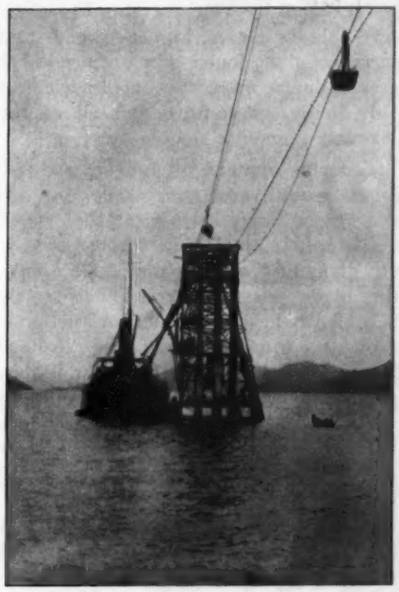


FIG. 6—LOADING PIER IN THE BAY

Co. have a rating of 6,000 tons, and the ore bins on the shore are arranged accordingly to hold 8,000 tons, so that as soon as a steamer arrives, loading can be commenced at the full capacity of the plant. The depth of water at the loading chute is about 27½ feet and the distance from the bins on shore is about 755 feet.

Fig. 1 shows the general arrangement of the loading line. The same system is adopted as on the first ropeway. The end pier in the water is arranged as an automatic angle station, and is so constructed that the cars travel round an end return-sheave, without manual assistance and without disconnection from the traction rope. They dump automatically on arriving over the chute; after discharging, they return again to the loading station. It is almost self-evident that the operation of such a line

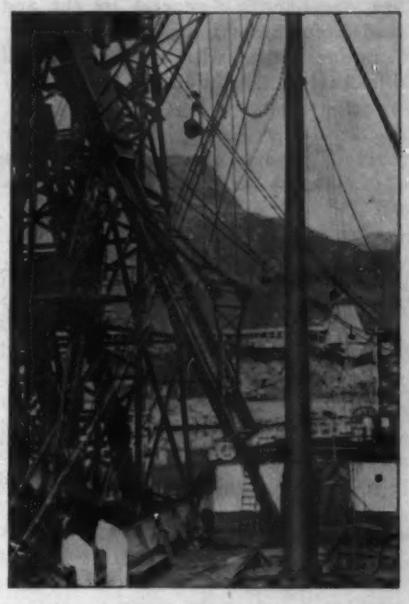


FIG. 7—CHUTING ORE INTO THE STEAMER

is simple and cheap. The loading chute is telescopic and hangs on a small rotary crane. Its height is such that the ore passes into the ship's hold at an inclination of at least 60 degrees, even at high tide and when the steamer is empty. The difference in the water level at high and low tide is about 13 feet.

The chute will be observed in operation over a steamer in Fig. 7. In constructing the loading pier, piles were first driven in the bottom of the bay and allowed to protrude about 3 feet above the surface of the water. The superstructure of the station was built on this pile-work. In order to prevent damage to the station from ships which maneuver with difficulty in the narrow waterway, strong fender piles are provided, against which the ships lie, without coming into direct contact with the pier itself. On the loading cableway, 100 cars of 1¼ tons capacity each are transferred hourly; therefore, the capacity of the system amounts to 125 tons per hour, and a ship may be loaded at a fairly rapid rate.

French Loading Plant

About the same time that the plant at Westfjord was completed another large Bleichert plant for handling iron ore was started on the French coast. It stretches about 1,480 feet into the sea, the single supports and the end station being erected on foundations formed by caissons. Two ropeways are carried on the same supports, so that one line may be always held in reserve. On this line 500 tons of iron ore are transported hourly to the ships. A number of jib cranes are installed on the loading station in the

sea, for handling general freight and coal from the arriving ships.

Besides aerial wire ropeways, Adolf Bleichert & Co. build telphers, cableways, belt conveyors, bucket elevators, rope and chain haulage plants, switching plants, grab buckets, blast furnace and cupola charging apparatus, plants for coaling steam boilers and for handling ashes and devices for mechanically quenching and conveying coke.

Progress in Steam Turbine Design

BY FRANCIS HODGINSON

IT SEEMS generally true that up to this time the economic advantages of the steam turbine in its various forms have not been as fully employed as possible by steel companies. The large public utility companies, whose product is power, have been compelled to employ every possible resource to effect cheap power production, and in that field the turbine has naturally found its chief development. The steel companies with whom power has been only one of the problems, and perhaps a relatively insignificant one, have in consequence not always experienced the efficiency of power plant operation that has been reached by our modern central station plants.

While the limitation of turbine capacity at the low pressure end is that of providing sufficient area to accommodate the large number of expansions involved, the problem at the high pressure end of the turbine is in dealing efficiently with the very minute volumes of steam there involved. It has become evident therefore, that if the low pressure stages were made double-flow, permitting steam to flow through two low-pressure elements in opposite directions, and the high-pressure element were to remain single-flow, increased capacity as well as higher economies may be obtained. Inasmuch as the number of elements in a turbine are proportional to the heat drop, it follows that a turbine made double-flow will have twice as many elements as a corresponding single-flow machine. Therefore, when the low-pressure portion was made double-flow, in the manner above referred to, the machine became undesirably long, and to obviate this difficulty, a portion of the turbine was replaced with an impulse element of the Curtis type, which has the advantage of dealing with a given heat drop with less axial length, as well as frequently being equally efficient as a corresponding reaction element where the blades are small and the leakage ratio relatively high. The impulse element of the high pressure has a further mechanical advantage of increased flexibility which permits different nozzle areas and proportions to be employed, rendering a standard machine adaptable to be readily changed to operate with different capacities, pressure and superheat. Inasmuch as a substantial pressure and temperature drop may take place in the nozzles, the employment of an impulse element permits the steam of high pressure and temperature, to be enclosed within small chambers separate from the cylinder structure. This machine is called a Semi-Double-Flow turbine. A further increase of capacity may, of course, be realized by running the low-pressure blades at a higher speed and carrying the double-flow principle to greater limits, *i. e.*, the impulse element only being single-flow, and all of the reaction elements double-flow.

The employment of double-flow turbines would not necessarily be advantageous were any rotational speed available. If single-flow turbine of given diameter were made double-flow, the blade passages would necessarily be of half the dimensions for the same capacity, thus doubling the leakage losses. Therefore, the double-flow principles should only be employed where the volumes of steam are such that for mechanical or other reasons, sufficient areas of blade passage at the low pressure cannot be otherwise obtained, it being remembered that if a speed be selected which is low enough to permit the low-pressure blading being single-flow, the speed would be far too low for the best design of high-pressure portion.

These limits of capacity, of course, apply to turbines designed for complete expansion in the blades, in the case of reaction elements or complete absorption of steam velocity in the case of impulse elements. By increasing the areas of the high-pressure elements, an almost unlimited quantity of steam may be passed through the turbine, enabling it to develop correspondingly enormous horsepowers, but by so doing, either the expansion will not be complete within the turbine blading in the case of reaction turbines or in the case of pure impulse turbines, the velocity through the last row of blades will be so high with relation to the speed of the blades themselves that there would be losses due to residual velocity in the steam after it has left the turbine. The last row of blades is, therefore, the determining factor, and the losses involved because of this being too small are precisely the same in any type of turbine.

Up to 1910, it was the general practice to design turbines for moderate vacua only. While purchasers of turbines talked glibly of 28 inches of vacuum and better, it was indeed seldom that even 28 inches was actually maintained in the average plant. Of course, standardization is a factor of commercial success in machinery building, so that it was desirable to design turbines for the average condition rather than the exotic one, so the above-mentioned machines were not capable of expanding the steam materially beyond 28 inches vacuum at full load. Hence the vacuum correction, *i. e.*, the gain in economy per inch of vacuum beyond 27 inches was relatively low, approximating 3.5 per cent at full load. The rapid application of turbines up to this time brought with it very material developments in condenser design, making it desirable for large turbines, at least to expand to 29 inches vacuum.

Before describing the latest machines, some discussion as to the losses involved in the two respective types of turbine elements, viz., impulse and reaction, would be in order. The impulse element comprises a nozzle in which the steam is expanded to the exhaust pressure of that element. There is a complete energy transformation within the nozzle transforming the potential energy due to pressure into kinetic energy. This nozzle is followed by certain rows of blading. If the blades may be operated with about 40 per cent of the velocity of the steam, one row will economically absorb this velocity and we have the well-known Rateau or De Laval type of turbine. If the blade velocity must be materially less than this, it is customary to employ more rows of blades, the steam leaving the first moving row being re-directed by means of some guide vanes onto a second row of moving blades. The highest efficiency obtained with this combination is where the blade velocity is about 22 per cent of the steam velocity. With higher steam speeds and lower blade speeds, the rows of moving blades may be employed per element, when the highest efficiency

Abstract of paper presented at the New York meeting of the American Iron and Steel Institute, May 22-23. The author is engineer of the turbine department of the Westinghouse Machine Co., East Pittsburgh.

will be obtained with this ratio about 13 per cent, the above being approximately correct with blade speeds of 300 to 500 feet per second. The highest efficiency, however, is obtained with a single row, which may, under favorable conditions, reach 80 per cent. By using the higher pressure range in the nozzle or lower blade speed, or both, thus necessitating the greater number of velocity elements, the efficiency falls off quite rapidly, so that a three-row velocity stage element is now only used in very extreme cases, such as in the reversing elements of marine turbines. Their efficiency will hardly exceed 50 per cent. The efficiency of the two-row element may be 65 per cent or 70 per cent.

The efficiency of the nozzle itself is of a high order, particularly with small pressure drops, approximating 95 per cent for 8 to 10 B. T. U. and falling off to about 82 per cent for a 200 B. T. U. drop. The losses in the blades are:

1—Hydraulic losses, which depend upon the relative velocities, blade angles, etc., and receive the same consideration as in an hydraulic turbine.

2—Friction and eddies, which increase with the velocity of the steam in the blade passage, and hence become greater with a greater number of velocity abstractions.

3—The nozzle zone does not generally occupy the complete circumference of the circle. The blades on entering the zone of the nozzles, require that the medium that is stationary within the blade passage be accelerated by the steam leaving the nozzles, which reduces the velocity. At either end of the nozzle zone, there are blade passages only partially filled, thus causing eddies, which condition is repeated at each velocity abstraction causing losses known as spreading.

4—Skin friction on the exposed surface of the disc, sometimes with the disc type turbines, owing to the large amounts of exposed surface, amounts to a great deal. The blades themselves, where only a small portion of the circumference is occupied by nozzles, are an additional source of friction.

5—Leakage losses in an impulse element are usually very small, and are at the point where the shaft passes through the diaphragms between the respective elements.

Losses in Reaction Turbine

In the Reaction turbine, which it should be understood technically comprises a series of stationary and revolving nozzles and not blades, the following losses are involved:

1—Hydraulic losses, which depend on the blade angles, and the ratio of the steam velocity to the blade velocity. These velocity ratios vary from 50 per cent in the small to 75 per cent in large units, the hydraulic losses for the above ratios being from 22 to 10 per cent, respectively.

2—Nozzle losses, which, as in the case of the impulse turbine, are low, but particularly so in the case of the reaction turbine, because of the many stages and the small B. T. U. drop per stage.

3—Leakage losses in a reaction turbine form a most serious item, and where the steam volumes are small, such losses may amount to 20 per cent, but in the combination type turbines, where reaction elements are employed for the low-pressure portions, the losses become inconsiderable, ranging as low as 5 per cent.

4—Skin friction, and the losses previously referred to in the case of the impulse element under items *2*, *3* and *4*, are exceedingly low inasmuch as the whole of the annulus between the outer diameter of the drum and the cylinder wall is completely occupied with the flow of steam and it is not subjected to the disturbances at the ends of the groups of jets, as mentioned in the case of the impulse elements.

Radiation, bearing friction, etc., are relatively unimportant, and would be the same for either type of turbine element.

It is evident, therefore, that higher economy is to be obtained from reaction elements providing the speed of the turbine and the volumes of steam are appropriate for the design with low leakage ratios, and conversely, the impulse element is better for the high pressure end of a turbine where the volumes of steam are small.

In the matter of turbine blading, there has been a good deal of misapprehension, although in earlier years considerable apprehension was fairly justified for with all types of turbines. The design and material of turbine blading in recent years have undergone some evolution. Blading, of necessity, is subjected to very arduous conditions. It works in a steam current of considerable velocity, the steam oftentimes being laden with moisture, and sometimes with chemicals and solid foreign particles as a result of priming boilers. Centrifugal stresses, must, of course, be properly considered, but far more important is the fact that any design of blading in any design of turbine, must be able to withstand, so far as may be, the tendency to vibrate in the steam current. The characters of the two salient types of turbine elements, impulse and reaction, require blading whose appearances but little resemble each other, the one requiring massive blade sections and the other a relatively light section. However, the strain on the blades due to centrifugal force is the same in either case, and in the event of collision, between blades, the one is as subject to injury as the other with the difference, however, that the results of the wreck may be more far-reaching in the case of the more massive blades. In some of the early designs, breakages were due to contact between the stationary and revolving elements due to distortion of the cylinder structures. This has been eliminated by the better design of these structures, the elimination of ribs and all unnecessary protuberances which might lead to internal strains in the castings or distortions due to uneven heating and cooling.

Blades Break Through Vibration

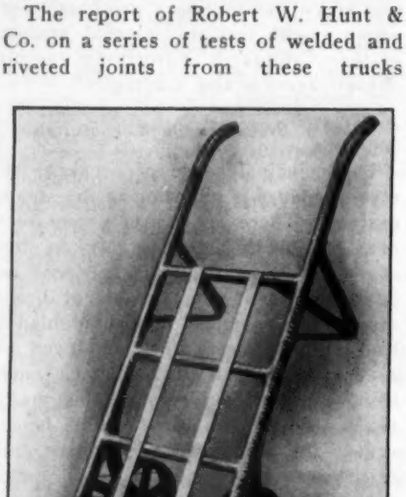
The principal cause of breakage of turbine blades is vibration in the steam current. There are scarcely any records of blading having broken because of centrifugal force *per se*. Shrouding and other means of bracing the outer ends of turbine blades to each other have been employed to reduce the tendency to vibrate. Such things have the effect of raising many times, the natural period, and hence reduce the amplitude of vibration, but do not completely eliminate it. Later designs of blading have their sections tapered, there being some 40 per cent more area of cross-section at the root than at the tip. There may be some vibration with this construction, but the deflection will be distributed over considerable length instead of being concentrated at the point of attachment. The later blades have a foot forged on the end, which goes in a groove that is in the floor of the main groove of the blade carrying element. The spacers between the blades are dovetailed to correspond with the dovetailing of the main groove, thus completely interlocking the blading and rendering the strength of attachment as strong as the blades themselves. Larger blades have their grooves provided with compound wedges which help to more completely fill the grooves.

In 1913 a number of contracts were taken for machines ranging in capacity from 15,000 to 20,000 kilowatts maximum. Those for 25-cycle service, operated at 1,500 revolutions per minute, while the 60-cycle, 15,000-kilowatt maximum rated units ran at 1,800 revolutions per minute. In all these cases the complete expansion was carried out within a single cylinder.

Truck With Welded Joints

A striking example of increased efficiency and decreased cost of manufacture by welding rather than drilling and riveting is shown by the Standard Improved Truck Co., Chicago. This company's truck previously was put together by drilling and riveting. Welding was proposed and a test truck was made by this method, the Oxweld process being used. Results were so satisfactory that it was adopted. Welding has not only produced a one-piece truck, but the output per man has been increased about 20 per cent, with a saving of over 30 per cent of the previous cost of manufacture.

The report of Robert W. Hunt & Co. on a series of tests of welded and riveted joints from these trucks



STEEL TRUCK WITH JOINTS WELDED INSTEAD OF RIVETED

makes some unusual statements. The tests were made on joints produced by uniting a cross tube to a stringer tube by welding and by the old process of drilling and riveting. The stringer tube in each case was 1.67 inches outside diameter and the walls were 0.13-inch thick. The cross tube in each case was 1.31 inches outside diameter with walls the same thickness as in the stringer tube. Force was applied to the cross tube in a line with its axis, the stringer tube being supported each side of the joint by blocks against which the pull was exerted. Steel plugs were inserted in the stringer tube opposite these blocks and in the cross tube at the point where the pull was applied, to prevent collapse at these points.

In a test of a joint welded by the oxy-acetylene torch, it was found that under a load of 17,090 pounds the cross tube, on which the tension was applied, began to scale, indicating that the elastic limit of the steel in tension had been reached. Under a load of 24,540 pounds, considerable reduction was noted in the cross section of the stringer pipe at the point of connection, but there was no sign of rupture at the weld. Under a load of 25,460 pounds the cross tube broke from the stringer tube at the weld.

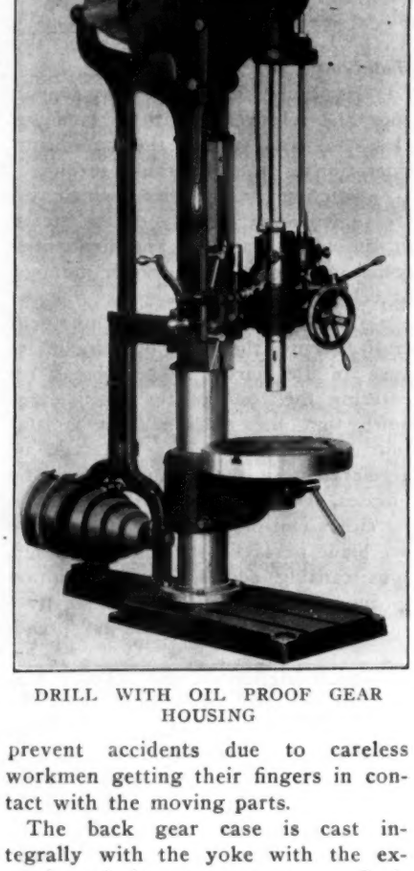
In a test of a riveted joint with two ¼-inch diameter rivets in double shear uniting the cross tube to the stringer tube, it was found that under a load of 2,920 pounds a slippage of 1-16-inch appeared at the connection, due to bending the rivets and loosening the connection. Under a load of 4,740 pounds the rivet in the stringer tube was sheared off.

In another test of a riveted joint, the connection was by a ¼-inch rivet in double shear in the cross tube and a ¼-inch riveted connection inserted through the stringer tube, the head being in tension. Under a load of 3,060 pounds a 1-16-inch slippage of the connection was observed as a result of the bending of the rivet in the cross tube and the loosening of the connection. At 4,010 pounds the separation at point of connection was ½-inch and under a maximum load of 5,800 pounds the rivet in the cross tube sheared off and the rivet connection in the stringer tube pulled partially through the stringer tube.

A report was recently presented to the British Tin Plate Association on working conditions in Germany and Russia as compared with those in South Wales. The report was, in substance, as follows: In Wales, four men per mill are employed, a roller, doubler, furnaceman and behinder; in Germany, five, the additional man being a furnaceman's helper; in Russia, seven, the two additions being a behinder's helper and a bar dragger. In Wales, the average output per eight hours is 45 boxes of light plates, 28 x 20 and 30 x 21 inches, as compared with only 42 in Germany, where there is a larger force per mill; in both countries the production sometimes reaches 60 to 70 boxes. The Russian mills have an average output of 95 to 100 boxes and an occasional output of 110 to 130 boxes. Their capacity is due to their large mill force and to the fact that the mills have three furnaces, one for heating the iron, and the other two in charge of the furnaceman and his assistant, respectively. The German and Welsh mills have only two furnaces.

High Speed Vertical Drill

The accompanying illustration shows a new high speed vertical drilling machine recently placed on the market by the Superior Machine Tool Co., of Kokomo, Ind. In designing this machine the manufacturers have recognized the growing demand for more perfect lubrication of the high speed moving parts of this class of machinery, which on account of their position are generally neglected by the operator. Therefore the friction back gears and the spindle driving gears are completely encased in six oil retaining housings. The housings at the same time serve as guards and



DRILL WITH OIL PROOF GEAR HOUSING

prevent accidents due to careless workmen getting their fingers in contact with the moving parts.

The back gear case is cast integrally with the yoke with the exception of the gear case cover. It is machined as a unit for receiving removable bronze bushed bearings with which the machine is equipped throughout. The gear case cover is securely attached and packed so as to form an oil tight compartment to enable lubrication by the splash system. It is said that one supply of lubricant will last for several months. In addition to the gear housings, this machine is equipped with the usual features found on modern high speed drilling machines.

Taylor System at Franklin Plant

First of Three Articles Dealing With the Results of Scientific Management in an Automobile Factory

BY G D BABCOCK

THE principle which I wish to discuss in this paper is that of a task and the accomplishment toward the task in magnitude and rate. This is the foundation for the belief that any plan of effort which focuses toward a desired result will cause an accomplishment more perfect than before and the rapidity of this accomplishment will be measured greatly by the intensity of the plan which directs to the focus.

A desirable attainment and one which influenced us to direct our attention to this plan especially was the elimination of the peak load of employment of workmen. The tendency in automobile production has been to follow very closely a schedule established by public sentiment and seasonable demand, with the result that labor to produce was drawn from a normal market and usually about the time that the market had again filled, was thrown back on it. I believe it is needless for me to speak of the details which make it desirable to eliminate this peak load. Universally the employment should be uniform or uniformly accelerated, and to obtain this has been one of the main objects in our control plan.

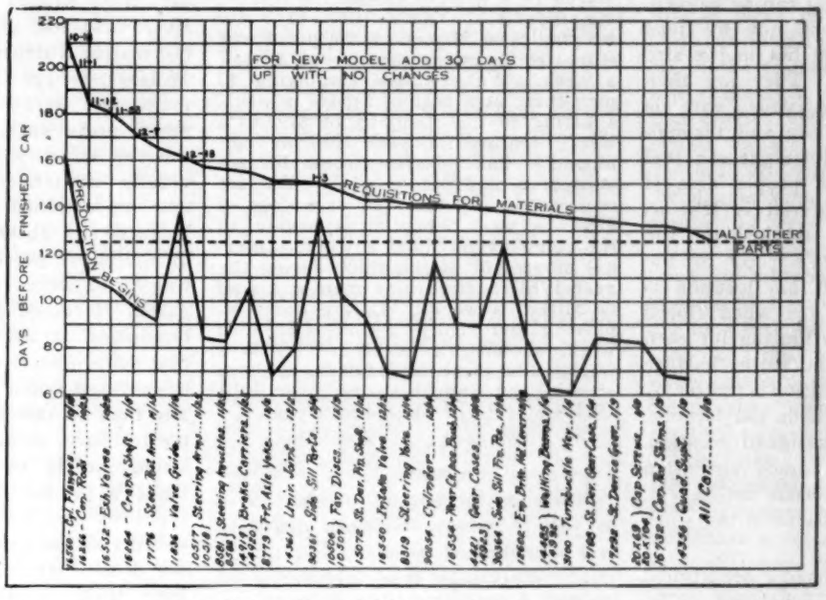


FIG. 1—CHART SHOWING PARTS REQUIRING TIME BEYOND 125 WORKING DAYS

Some causes of peak load in the employment of workmen beside that of management are uncertainty of demand for product, seasonable demand for product, small capital invested in the business, strong competition with small margin of profit, any of which can be materially improved by plans founded upon a careful analytical study and constructive action. Our experience has been that through applied scientific management efficiencies have been created, sales have been enhanced due to better deliveries, and lower price, and greater confidence of the purchaser has come about by the uniform standard of the quality of the product. This has been further affected by good service, better temper of the sales organization due to promise of delivery being kept, and by those who have come in contact with our works or with the workmen seeing the more orderly condition of our plant and the better feeling of the workmen themselves as reflected in their expressions.

It is no reflection on a management to secure the advice of specialists in methods of operation. Not a day goes by but that representative specialists of machine tool manufacturers advise us that we are in the dark ages of shop practice; and this practice perhaps rests upon their product of but a year ago. Structural and tool steel specialists are sure that if we change from their material which we are now using to others of particular chemical analysis, that our results will be greatly enhanced. We know that it is wise to listen to their advice. The viewpoint is, however, quite different. In the one case we seek for advice that we wish to buy. In the other the specialist has something which he wishes to sell. They are both good and have their place in our industrial development.

The writer was in a responsible position with this company some years before this practical task plan of work was started and the deductions are from data which was compiled by him over the periods mentioned. I shall not attempt to suggest how others may do and offer no panacea for poor management. I am trying to relate an experience of the application of a much considered and discussed form of management as translated by one manager for his particular business. The first application of the work was on our stores requisitioning, purchasing, receiving and issuing. Up to this time we had a relatively inaccurate annual store inventory. Although we inspected incoming materials and that very rigorously, the inspection was not performed before their receipt into store; invoices were passed on receipt, and having no particular pressure on it, inspection consumed a great amount of time and caused delay in moving out of stores. This plan was changed and inspection of raw materials was made before the purchase order was credited with the receipt of the goods. At first this was a difficult task since the passing of invoices was delayed, but at the present time it demands little of our attention to maintain it permanently in a first class working form.

Due to the fact that the plan of progress was rather arbitrary and different individuals worked according to their own best translation of what

A paper presented at the Worcester meeting of the National Machine Tool Builders' Association, April, 1914.

should be done, the burden at times on the inspectors and receiving clerks was tremendous. Express and freight shipments ran high at times and caused a serious amount of overtime work with its incident confusion and inaccuracy. The control plan, which will be described later, has practically eliminated this difficulty, and the flow of materials now in stores is very smooth and uniform.

The receiving clerk had no knowledge of what to expect in any given package but would try to record what he found. The assumption was that he would be more accurate and would not be liable to assume, but this theory has been completely exploded by our more recent experiences. He is now supplied with a copy of the purchase order placed with the vendor and thus knows exactly what to expect from the vendor. When the count is made for the passing of the invoice of small materials, like forgings, castings, etc., that can be bagged, they are counted out not by tens or some even number, but in the size of the outgoing lot. They are then bagged in these lot sizes, wire is wrapped around the bag and through the cloth and a lead freight car seal locks it. A tag with proper data is attached and the material is sent to the bin location as marked on the stores receiving clerk's copy of the purchase order. This bin location is carried by the stock tag when closed (and we have a stock bin tag for each lot of material) to the stores balance sheet. When a requisition is written by the balance clerk he adds old location, which is the usual assigned location. This has eliminated much confusion due to moving materials on receipt of new lots to new places in the stock room.

Formerly the purchasing department was forever rushing or holding up orders and of course the parties from whom we purchased had the same experience. In the recent year or so our orders have been placed with such regularity, that within a few days that they should receive an order, some of our vendors call and ask if they shall make preparations for an order which is due. The purchasing department has materially reduced its cost and seems to be exceptionally happy under the new order of things.

Perishable goods have been put under a double bin system and others will be as fast as we can physically arrange for it. In this double bin system the receipt of material is not confused with outgoing, or on hand. The balance shown by the bin stock tag is brought to a flat zero when one-half of the bin is emptied. It allows extraordinary check of materials on hand and it takes the stock man in as a factor in accurate record.

Rejected materials are handled with despatch. Surplus has been very materially decreased and the equivalent stores investment reduced. The quick handling of the stock in the room, on account of all lot sizes being maintained standard, and the delivery to the shops and through the shops has furnished a considerable amount of our savings.

I quote from a report from the man who was at that time head of the stores department and is now assistant superintendent. The latter appointment was in recognition of his services in assisting us to bring about this result, as one of many.

March 16, 1914.

Mr. G. D. Babcock,
Production Manager.

After my conversation with you on March 14, I wish to submit the following reports: During the year 1910 we employed 34 men in the purchased stores room at an expense of $381.07 a week. We are now employing 13 men there at a cost of $183.67 a week, a saving to the company of $197.40 a week. During the year 1910 we employed in finished stores room 10 men at a cost of $97.96 a week. We are now employing six men at a cost of $78.41 a week, showing a saving to the company of $19.55 a week. Internal movement of the stock during the year 1912 required nine men at a cost of $108.84 a week. We are now employing four men at a cost of $53.01 a week, showing a saving of $55.83 a week. The three departments are now showing an annual saving over 1910, 1911 and 1912 of $14,184.56 a year.

(Signed) Wm. Dunk,
Chief of Stores.

Much of the saving of the above as will be shown has been due to a less complicated product, and this is quite especially true in purchased stores.

Peak Load Eliminated

To sum up the stores situation, the peak has been practically swept off and the employes feel but a uniform burden of effort. We have practically no experience of the "Unexpected Happening". The same features that affected the stores department marked the experience of the purchasing department.

Coincident with the initial planning for the handling of stores, we began the classification of stores, and the reconstruction of the clerical methods of handling the accounts so that they would be of prime use to the works as well as to the accounting department.

The accuracy of our stores inventory has increased each year due to this careful work and the particular method employed of checking until now with a considerable less number of clerks we have a very much greater amount of information. This information is accurate. As evidence of the latter the auditors of our stock gave us a clearance for the last year of 0.3 per cent error of stock on hand, and approximately 0.03 per cent error on the transactions in and out of stores for the year. This clearance was determined by a detailed check of our ledgers and material on hand and of the accounting department records.

Previously our manufacturing orders called for miscellaneous parts or assemblies, and the assembly order contained a specification of the parts which were to be used in that assembly. Parts orders were written independent of the requisition for material. No date was specified for the part to be due in finished stores. The orders were written in quantities of 25, 50, 75 and 100, and in general it did not matter whether the part was small or large, except in the case of automatic and screw machine work, or punch press work, when an order for the full quantity for the season was usually written. These orders were not apportioned to the material ledgers, and therefore it was a case of the most persuasive foreman getting from stores the material for his parts. He could draw from stores on requisition at any time that he could find some material and unless he had a shortage could finish his order at any time he saw fit. He had a schedule for parts to guide him. This consisted merely of a schedule of the month's production for the different types of cars but set back as many months as our progress clerk assumed the works would need and still deliver them safely into the finished stores room in time for the issue to assembly. We had but few small subassemblies. The single group issues for one of our large assemblies might require as high as a quarter of the variety of parts in the finished stores.

After the assembly order was issued it was given to the finished stores keeper who was supposed to deliver the materials to assembly against that order as rapidly as possible. When first parts of a lot were delivered to the assembly floor, the assemblers started to put them together and from that time on chasers tried to force the parts, which were lacking, through the shops on the remaining operations and in and out of the finished stores room to the assembly floor. It was a merry chase.

One result of this was that opera-

tion set ups varied from 1 to 100 pieces. With an average of ten operations on different drawing numbers, or parts, to each machine and with the preparation time of the machines uncertain, confusion resulted by interference of orders from the different shortage chasers. Very high costs were thus created. We, however, produced cars for a great many years under these conditions. Engineering changes were frequent, the demands of the buying public was uncertain, and then it seemed to use to be the only way of solving the problem. Now we can see how it could have been solved in a very much better way even with full complication of a variety of models and many changes.

When we began the classification of our products the elimination of this confusion and trouble also began. Through the findings resulting from the classification of the product, our whole scheme of control of work has come about.

The first two parts made which can be fastened together as a part of the finished structure are fastened together and turned into finished stores. This unit and other parts and fastenings are issued from stores and assembled into a larger group, and turned back into stores. This continues throughout the product.

In this classification we discover that in the new car, where our lot sizes have been adopted to the standard as used at present, we must make the requisition of our first piece 200 working days ahead of the time that the car can be finished. It is important, therefore, that we not only check, by assembling, the condition of our product, but that the lot sizes of assemblies be proportioned economically as well as lot sizes of parts.

The flow of the different parts into the sub-sections; into sections; divisions, groups and finished product are charted, and with detail parts entered with symbols constitute the parts analysis of our product.

On each part we determine the mechanical operations through which it must go. This is also true of the assemblies. We study the size and form of the materials to use, also whether patterns, dies, or tools must be prepared, and in fact all that we can of the product in its last detail from the standpoint of the factory effort upon it. The time element is a very important factor in this analysis, both on account of certainty of delivery and of valuation of material and labor investment. The analysis of the product furnishes the ground work on which our control rests. Upon the first analysis of our product we found the cause of one of the greatest troubles that we had experienced, in other words, our inability to attain a schedule that seemed perfectly possible. Thirty-nine parts in our whole car, Fig. 1, were the cause of this, and the two longest time parts in this list were two of the cheapest things put into our car, the cylinder flange and the exhaust valve. All of our effort on product analysis alone was well repaid by this one discovery. Standard were made for these parts and the time between the first effort on the first part and the finish of the completed car was greatly reduced. Later discussion of the uniform schedule will show another very important result attained after this study that has to do with the investment of capital.

(To be continued.)

New Bearing Bronze

The American Metal Co., Pittsburgh, which recently completed a new plant at Wilkinsburg, Pa., has been conducting a number of tests to determine the efficiency of a bronze journal bearing, composed of 65 per cent copper, 30 per cent lead, and 5 per cent tin, treated in crucibles. They are solid bronze castings requiring no babbitt surface.

In a test for the Baltimore & Ohio railroad, a 22-pound bearing was placed under the tender of Pacific Type locomotive No. 2127. After the engine had run 51,000 miles, an examination of the bearing was made, it being said that it had worn 1/32 of an inch, without becoming heated at any time. Other bearings on the tender were re-babbitted six times each, according to the shop superintendent in charge of the locomotive.

For mill purposes, this bronze may be hardened into what are claimed to be superior mill brasses. A test of this nature was made at the Soho works of the Jones & Laughlin Steel Co., Pittsburgh, where two 75-pound mill brasses were used under the rolling table of an 108-inch plate mill, the minimum weight of which is estimated at 10,000 pounds. The superintendent of the mill is said to have stated that the two brasses gave continuous service for four weeks. On account of the position of the bearings, it was impossible to lubricate them during the test. Graphite in the lead acts as a lubricant, it is stated, making the metal practically frictionless and reducing the amount of the lubricant required.

The plant of the American Metal Co. is very similar to that of an ordinary brass foundry. Four furnaces, of concrete and fire brick construction, have been built at one end of the foundry building, 40 x 90 feet, in which a composition of copper, lead, tin and flux of powdered charcoal is melted. A chain hoist is used to carry the molten metal, by means of a trolley, to the molding floor at the opposite end of the plant, where the bearings are cast in the usual manner. After the gates have been sawed off, the bearings are polished on an abrasive wheel and then machined on lathes.

Preventing Broken Shafts

Solution of the broken-shaft problem is said to be promised by a machine the navy department has secured. Not long ago, after an exhaustive examination, the conclusion was reached that broken shafts were the result of vibrations, rather than to the extraordinary strains to which the shafts are subjected. The theory that the breaking of shafts is the result of flaws in the steel now is almost universally discarded. Experts are of the opinion that a perfect shaft will crack if it is turned at a speed that creates vibrations that give it a certain whip. The curious feature is that no two shafts vibrate to the danger point at exactly the same number of revolutions.

To determine at how many revolutions the vibrations of the shaft reach a dangerous point is the purpose of the new machine, which will be tried soon by the navy. The machine, when attached to the shaft, makes a record that indicates the vibrations. At the same time it keeps a record of the number of revolutions, and by running the engine of the ship at various speeds it is expected to obtain a record that will indicate at how many revolutions the vibrations become dangerous.

A. Allen & Son, 486 Greenwich street, New York, have issued a very elaborate and complete set of instructions on fitting Allen metal rings to steam engine pistons. Detailed drawings are included showing just how the piston should be designed and machined to use Allen metal most effectively, and the text describes the method of inserting and securing the rings.

"Roller-Smith" automatic charging panels, for use with isolated storage battery lighting plants, are described in a pamphlet recently issued by the Roller-Smith Co., 203 Broadway, New York. This panel was designed to enable the layman to avoid difficulties usually encountered in the operation of storage battery plants.

Rebuilding Charcoal Furnaces

For some years past, the cost of charcoal for blast furnace purposes has been steadily increasing and in order to offset this constantly mounting expense, the operators of charcoal furnaces have been obliged to install many improvements and labor-saving devices that would have been considered out of place on any but the largest steel plant furnaces a decade ago. Several of the charcoal furnaces in the Michigan district have been completely rebuilt within the last two or three years and a large amount of the reconstruction work has been handled by the Muskegon Boiler Works, Muskegon, Mich.

Last year this company rebuilt the stack of the East Jordan Furnace Co., East Jordan, Mich., furnishing a new shell, downcomer, dust-catcher and gas mains. The East Jordan furnace was built originally in 1907. It is 60 feet in height and 10 feet in diameter, and is charged by hand. The blast is heated in two modern 15 x 60-foot stoves, which are located alongside the ore hoist. The remodeled furnace, together with the new downcomer and dust-catcher, is shown in the accompanying illustration. The downcomer, which is inclined, supports a steel stairway leading to the top of the furnace.

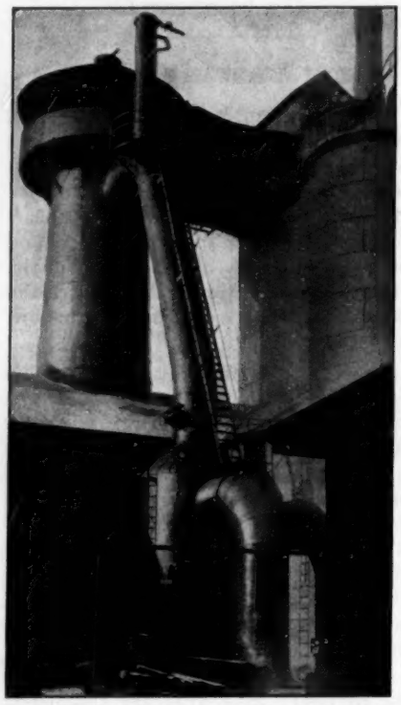
The Muskegon Boiler Works is now engaged in rebuilding the Newberry furnace of the Lake Superior Iron & Chemical Co., at Newberry, Mich. This stack is 10½ feet in diameter and 51½ feet high and is provided with four stoves. It was built in 1883 and rebuilt in 1892 and 1903. Two years ago the Muskegon company furnished all of the plate work for the new furnace of the Stephenson Charcoal Iron Co. at Wells, Mich. This plant was fully described in THE IRON TRADE REVIEW, Oct. 3, 1912. Several years ago the Muskegon company rebuilt the Spring Lake Iron Co.'s furnace at Newport, Mich., and the same concern has furnished bosh, bottom plates and miscellaneous equipment for plants at Ashland, Wis., Elk Rapids, Boyne City and Manistique, Mich.

The Wiener Machinery Co., 50 Church street, New York City, has issued a circular describing its line of machines for bending angles, beams, channels, rails and other shapes. These machines have a capacity for bending true rings of angle iron without preheating the whole bar and are especially adapted for boiler makers, structural shops and manufacturers of mining equipment. The rail machines are said to be capable of bending the heaviest rails, including girder rails for street railways.

Fuel Briquetting

By Edward W. Parker

The fuel-briquetting industry in the United States in 1913 was characterized by a net decrease of two in the number of operating plants and a decrease of 17 per cent in the quantity, but an increase of 5.8 per cent in the value of the manufactured product. If the future of this infant relative of the coal-mining industry is to be judged by the record in 1913, the judgment should be based on the increase in value rather than on the fewer plants and decreased tonnage. Briquetted fuel in the United States is essentially a domestic fuel, for which there was a slackened demand during the year, owing to the exceptional mildness of the winter of 1912-13 and of November and December, 1913. In consequence the consumption of briquets, like that of raw fuel for domestic purposes, was less in 1913 than in either 1911 or 1912. An exception to the general trend is to be noted on the Pacific coast, where there was an increase of one in the number of operating plants and a production in 1913 exactly double that of 1912, with a gain in value of somewhat larger proportion. Three plants in the eastern and central states that made briquets in 1912 were out of commission in 1913. One of these, at Murphysboro, Ill., was destroyed by fire in the early part of 1912 and probably will not be rebuilt. One of the other inactive establishments had been built by the Rhode Island Coal Co., at Portsmouth, R. I., and with the failure of the coal-mining enterprise became useless. The third idle plant was one of small capacity and output, operating on peat at Fertile, Ia. The inactivity of all three of these plants had little influence on the total production in 1913.



REMODELED EAST JORDAN FURNACE

Output in 1913

Of the 17 active plants in 1913, eight in the eastern states produced 62,244 short tons, valued at $240,643, compared with 107,181 tons, valued at $370,841, from nine plants in 1912; five in the central states produced 73,287 tons, valued at $360,408, compared with seven plants producing 89,714 tons, valued at $400,624 in 1912; and four plants on the Pacific coast produced 46,328 tons, valued at $406,276, against 23,169 tons, valued at $180,796, by three plants in 1912. It will be observed that in each geographic division the average value per ton was higher in 1913 than in 1912, although in the eastern and central states the production fell off. The explanation for the higher values in the face of decreased demand appears to lie in the general enhancement of values of all industrial products in 1913, in which higher cost of manufacture was a factor. In the production of briquets in 1913, seven plants used anthracite culm or fines; one used semi-anthracite; 1 semi-anthracite and bituminous slack mixed in proportions of 3 to 1; one used anthracite culm and bituminous slack, principally the former; five used bituminous or semi-bituminous slack; and two used carbon residue from gas works making gas from petroleum. Eight plants used coal-tar pitch for binder, one used asphaltic pitch, one used water-gas pitch, and five used mixed binders, the composition of which is not divulged. No additional binder is required in the briquetting of the carbon residue from oil-gas works. The two plants designed for the purpose of utilizing coke breeze, one at Point Breeze, Philadelphia, and the other at Detroit, Mich., have not been operated during the last two years, the abrasive action of the coke on the molds and machinery being too destructive for commercial success in these attempts to utilize an unmerchantable product of the coke ovens.

American Blast Furnace Practice

Second Article Showing the Evolution of Furnace Lines and Giving Details of Construction

BY HERMANN A BRASSERT

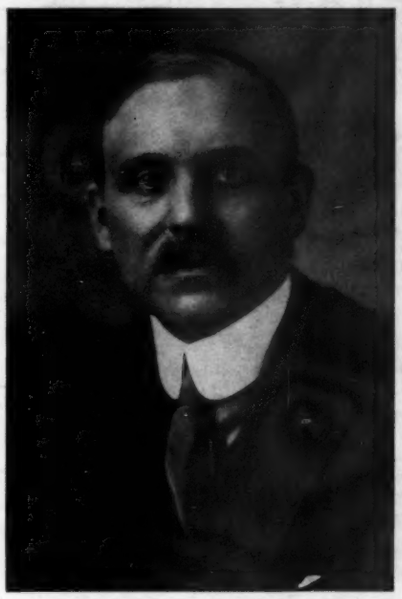
THE MANUFACTURER who does not constantly take stock of his equipment and rejuvenate it to suit the times, will soon find himself outclassed by his competitors. With the variety of possibilities which present themselves in the operation of furnace plants, many forms of construction can be worked out and many can be found successful. But every improvement should be inspired by one common aim, and that is to facilitate the utmost uniformity of practice in order to gain the highest quality of product and the greatest possible economy.

For the sake of uniformity and to eliminate the danger of mixing various grades and the necessity of frequent burden changes, adequate space and equipment for the stocking of ores should be provided. This feature will allow of a greater latitude in selecting the most suitable furnace burden at a given time. If a cargo can be spread evenly over a large pile, so that any cross section of it represents a true average of all cargoes received during a shipping season, the furnace will receive the ores in the most uniform shape.

The bins should be so designed that the ore can be easily withdrawn under perfect control on the part of the operator. With sufficient slope and closely spaced gates to prevent the sticking of the ores in the corners, proper movement of the entire contents can be secured. Furnace troubles are always more frequent in winter than in summer, due to the difficulty of correct charging when the materials are frozen. In cold climates, therefore, the charging floor should be enclosed and the bins heated, preferably by waste gases.

In handling the coke, the main object should be to avoid abrasion. That charging system is preferable which transfers the coke from the ovens or railroad cars into the furnace with the least number of drops. The coke can be charged by volume or by weight. The former method is independent of varying moistures in the coke, and automatically compensates for certain variations in quality, by delivering a greater weight of smaller, denser coke. This regulation, however, is not always correct, since smaller coke is not proportionately inferior, but it tends to equalize the error. Where the coke is uniform in moisture and furnace value, the weighing method will give excellent results.

The coke pockets should be made of ample capacity to avoid delays, and should be designed to keep all of the



HERMANN A. BRASSERT

contents in motion and to avoid the accumulation of fines—a most frequent cause of furnace troubles. The dust should be eliminated by screens placed in the bin or at the gates.

The charging or larry car should preferably be large enough to hold a full charge of ore and stone. This saves labor and wear by decreasing the number of trips, and allows the furnace to be kept full with the least effort, even when driving fast, at the same time rendering the percentage of error in weighing smaller.

The skip hoist can be either of the single or the double type. The latter has the advantage of filling the furnace faster, but brings with it the difficulty of obtaining an even distribution between the right and left side of the furnace, which must be overcome by proper construction of the top. Materials dumped from an overturning skip bucket will arrange themselves more or less according to size, the coarse particles falling the furthest and the fines remaining behind. In order to avoid uneven distribution of fine and coarse materials, the design of the skip bucket, receiving hopper and top should be carefully worked out; as should also the range of skip travel and the speed of dumping, which should be under positively fixed control. The single skip allows the use of a cylindrical bucket with bottom discharge, dumping centrally over the bell and giving a correct distribution on the top of the furnace. But with that design it is necessary to correct the distribution in the bucket itself with regard to coarse and fine materials. This is a difficult matter and can only be accomplished by rotating the buckets. This type of hoist, however, has the decided advantage of more carefully handling the coke charges, and for that reason has been largely adopted in Europe.

The blast furnace top itself has been the subject of more variations in design than any part of the furnace. Besides a gas seal, it has to fulfill the important function of proper stock distribution. It is difficult to accomplish this with a stationary top, and many furnace men prefer to abandon it in favor of rotating mechanical tops. Whatever type of top is selected, it must be borne in mind that a break-down generally necessitates stopping the furnace; therefore the construction should be simple and strong. If a good distribution can be obtained without resorting to the complication of rotary mechanism, all the better. If deemed necessary to employ a rotating top, such a design should be selected which will give a satisfactory distribution, even if it should cease to rotate.

Many of the irregularities of stock distribution bear no relation to the design of the top; as for instance, the building up of ore on the big bell, which with lake ores cannot be altogether prevented, even with the modern steep angles, and requires constant watchfulness, or the shifting of the furnace top relative to the furnace center caused by expansion and contraction; or the warping of the bell and hopper and the uneven wear of the stock-line. Neither can irregularities of charging—such as are

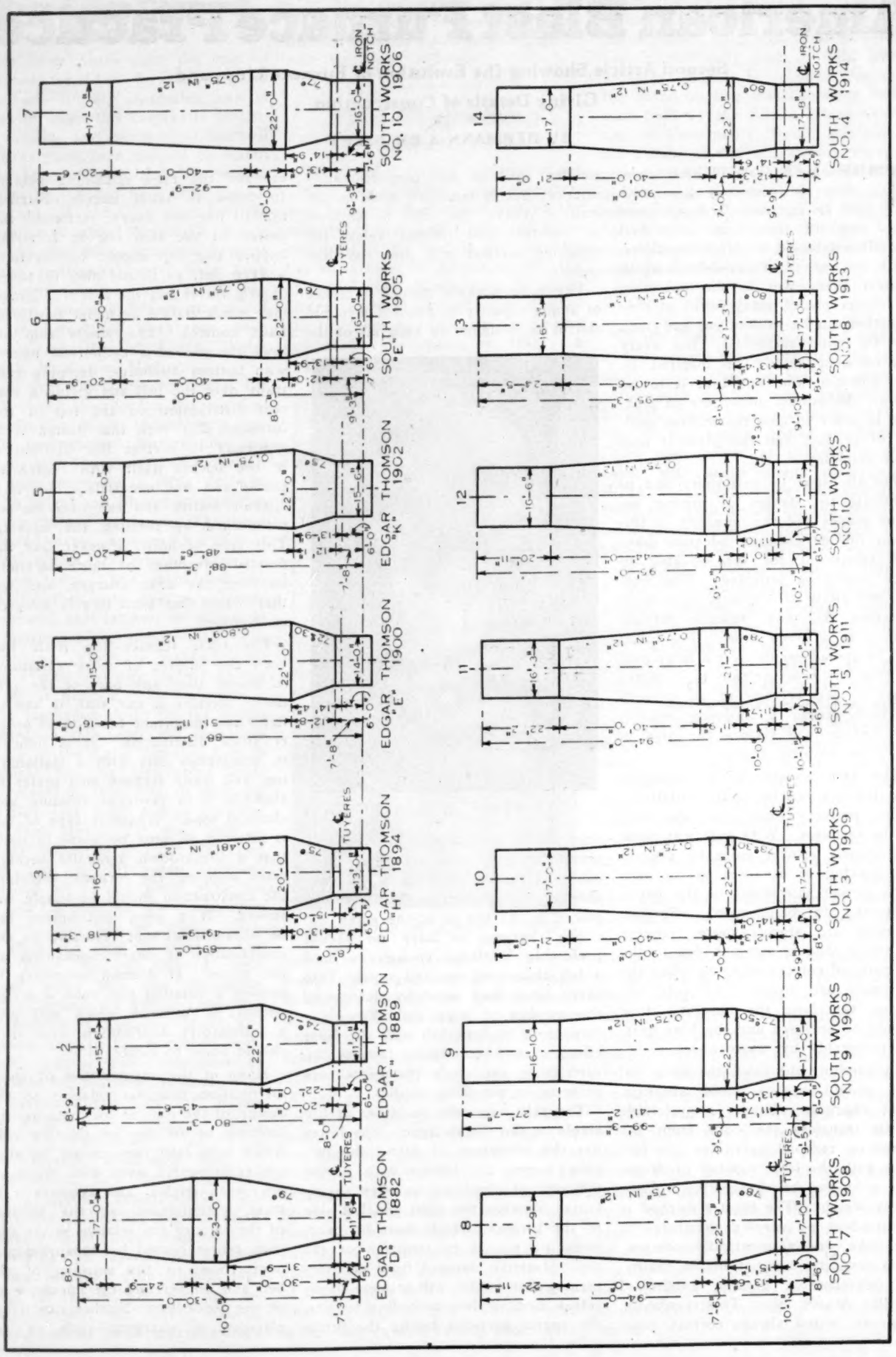

1 EDGAR THOMSON "D" 1882
2 EDGAR THOMSON "F" 1889
3 EDGAR THOMSON "H" 1894
4 EDGAR THOMSON "E" 1900
5 EDGAR THOMSON "K" 1902
6 SOUTH WORKS "E" 1905
7 SOUTH WORKS NO. 10 1906
8 SOUTH WORKS NO. 7 1908
9 SOUTH WORKS NO. 9 1909
10 SOUTH WORKS NO. 3 1909
11 SOUTH WORKS NO. 5 1911
12 SOUTH WORKS NO. 10 1912
13 SOUTH WORKS NO. 8 1913
14 SOUTH WORKS NO. 4 1914
TUYERES
IRON NOTCH

FIG. 1—EVOLUTION OF AMERICAN BLAST FURNACE LINES

caused by lack of care on the part of operator, severe weather and many other causes—be corrected by any design of top. It will be seen, therefore, that a rotating top is by no means the cure of all evils. Careful supervision, constant vigilance, a regular and frequent inspection, are the only safeguards and should be practiced regardless of the type of top in use.

With a uniform distribution on the big bell, the next question is how the charges should best be arranged in the stock column. There are two opposite methods of depositing the materials in the furnace. The one, which is used abroad, but not in this country, consists in raising a cylindrical bell and allowing the charge to glide off the hopper towards the center of the furnace, there forming a cone with an apex of fines and a base of coarse materials, which gives the gases a tendency to ascend next to the walls. This is counteracted by using a comparatively small hearth with tuyeres projecting far in, or a central gas off-take, and frequently by special stock deflectors. In European practice the stock column is much more open, less fines and considerable lump ores still being used with large sized coke and stone. Under these conditions this charging method seems to give satisfaction; and in many places it is still adhered to, in spite of the great complication of design, especially when combining the central gas off-take with a mechanical top.

Under our conditions, using practically none but fine ores, in order to obtain uniform practice, the principal aim must be to prevent the channeling of gases. As it is their natural tendency to follow the walls where the stock is continually loosened by friction, we deposit the ores next to the wall, thus forcing the gases to the center. In order to accomplish this we use a method opposite to the one described lowering a large conical bell and dumping the charges against the furnace wall, the finer materials remaining there on a higher ridge, the coarser ones rebounding and rolling toward the center. This opens up the stock column in the center and serves the same purpose as a central gas off-take, only in a milder form. A recent experiment made at South Works with a central tube, showed conclusively that this arrangement is too radical for Mesabi ores.

For the opposite purpose, that of loosening the stock next to the wall, various modifications of the plain bell have been tried. Such attempts were particularly frequent in the early days of Mesabi practice, when it was thought that the formation of scaffolds could be avoided by placing less fines next to the wall. Designs of this kind have mostly been abandoned, as it was soon found that the evil of gases channeling along the walls and unreduced ores descending in the center, with high fuel consumption and buckshot iron as the result, was too high a price to pay for keeping the walls clean. The plain bell with the gas off-takes at the periphery of the stack is evidently the best and by far the simplest design under our present conditions of raw materials. The problem to obtain a free working furnace on Mesabi ores could, however, not be solved until the correct furnace lines were established.

Development of Furnace Lines

Going back in history, when James Gayley, in 1890, read his memorable paper on the development of American blast furnaces before the British Iron and Steel Institute, he outlined the trend of improvements in his concluding remarks by stating that in the last decade there had been three steps: First, in 1880, the introduction of rapid driving, with large outputs and high fuel consumption; second, in 1885, the production of an equally large amount of iron with a low fuel consumption, by slow driving; and third, in 1890, the production of nearly double that quantity of iron, on a low fuel consumption, through rapid driving. Mr. Gayley himself, who was then in charge of the Edgar Thomson furnaces, was largely responsible for this progress. Much credit also belongs to the management of the Illinois Steel Co., which on its Union and South Chicago furnaces made the best yearly fuel records of that period.

In the early eighties the linings at the Edgar Thomson furnaces had boshes half way up the stack; as, for instance, furnace D, shown in the accompanying chart of furnace lines, Fig. 1. This construction was taken over from the charcoal and anthracite practice with hard ores. It was realized that with coke as a fuel and with softer ores, much more rapid driving was not only possible but highly desirable, if it could be done without an increase in fuel. The furnace lines were conformed to this idea and the boshes lowered from 30 to 20 feet, in the period covered by Mr. Gayley's paper. Also the 75-degree bosh angle was established. A furnace of this type is illustrated in Fig. 1, showing furnace F at Edgar Thomson in 1889. By the rapid yet consistent development of furnace lines and practice in this direction, and by strengthening his blowing equipment accordingly, Mr. Gayley was in a few years able to himself surpass the predictions made in his paper. By 1894 the output of these furnaces had been increased to an average of 400 tons per day with a coke consumption of less than 1,900 pounds. This was accomplished by raising the stack from 80 to 90 feet, lowering the bosh to 15 feet, and increasing the size of the hearth to 13 feet, thus maintaining the previously established 75-degree bosh angle. A furnace of that type is also shown in Fig. 1, giving Edgar Thomson furnace H in 1894.

A few years later Mesabi ores entered into the problem. In lowering the bosh and raising the furnace to 90 feet, still maintaining the 16-foot stock-line, the angle of the inwall had become steeper, as indicated in Fig. 1, and this had a tendency to retard the descent of the charges. The next step taken, therefore, was to increase the batter in the stack, which could be accomplished by narrowing the stock-line and lengthening the straight top section, or by widening the bosh. At the same time the advantage of still lower boshes was realized. These two developments together resulted in the lines of furnace E at Edgar Thomson in 1900. Furnaces of this type were able to produce over 500 tons of iron per day on a burden of one-third Mesabi ores, but it was difficult to maintain uniform practice owing to accumulation of stock on the flatter bosh. This suggested the return to the 75-degree bosh angle by the use of still larger hearths, a step which was not taken without hesitation, as we feared an insufficient penetration. But no difficulty of that kind was experienced, and furnaces of this type marked quite an improvement, by establishing the average yearly output of 500 tons per day on 50 per cent of Mesabi ores with uniform practice. Such a furnace is Edgar Thomson furnace K, built in 1902, which in 1903 averaged 539 tons of iron on 1,985 pounds of coke. I have given the Edgar Thomson furnaces as an example, as they were representative of this development and, together with the Duquesne furnaces, established the best blast furnace records of that period.

Similar lines, consisting of a 16-foot stock-line, ¾-inch to the foot batter of the inwall, a 22-foot bosh, a 14½ to 15½-foot hearth diameter and a 75-degree bosh angle were quite generally adopted on 90 and 100-foot furnaces using Mesabi ores. The amount of

these ores in the burden was gradually increased up to 70 per cent in the next five years, but not without showing a distinct increase in coke consumption, as shown by Table III.

The first experience with these ores had clearly shown that on account of their reducibility, they could be smelted rapidly and with a low fuel consumption, providing the furnace could be made to work uniformly, and the walls could be kept clean. The more regular, faster movement of the stock—by offering less opportunity for the gases to channel, and a more intimate contact and better heat exchange between ores and gases—allows a heavy burden to be carried in spite of the faster driving. The zone where the materials become plastic is kept at a uniformly low level, and there is less danger of scaffolds forming above the bosh.

The task, therefore, is to design a furnace in such a way that the least resistance is offered to the free travel of the stock. With the proper batter already established, the chief impediment remains the bosh. As the melting zone is lowered, the bosh must follow, otherwise the materials will strike the inverted angle before the proper shrinkage through fusion takes place, causing the furnace to hang. Furthermore, a steeper angle should facilitate the stock movement in the bosh, and should, in conjunction with an increased hearth diameter, tend to keep the materials loose in arriving at the tuyere zone, allowing of a free penetration by the blast and preventing high blast pressures. These ideas were embodied in successive linings of the furnaces at South Works by increasing the hearth diameter up to 17 feet 8 inches, decreasing the height of the bosh above the tuyeres below 12 feet, and steepening the bosh angle to 80 degrees, a development which is clearly shown by Fig. 1.

In the latest models of these furnaces the bosh is no longer a conspicuous part. The old theory, which attributed to the bosh the function of carrying the weight of the burden, and of narrowing the hearth to the point of proper penetration, must now be modified. The bosh seemingly has but one important duty—that of retarding the melting ores, so they will not run ahead of the coke and darken the tuyeres by reaching them before being properly prepared. There is nothing to indicate that we have reached the limit in low and steep boshes, simply by further widening the hearths and without resorting to such means as the elliptical furnace.

The hearth diameter, and not the bosh diameter, must today be recognized as the determining factor in influencing the rate of output. In designing new lines, the hearth dimensions should be established first, according to the desired production. By adding a bosh of correct height and angle, the bosh diameter automatically results.

As will be seen on the table of lines, stacks of different heights are in operation at the South Works. Whereas laboratory tests show that Mesabi ores can be completely reduced in a few hours by furnace gases at suitable temperatures, actual conditions are different. Practical experience proved that even with these easily reduced ores it takes considerable time, first, to thoroughly preheat every particle in a large bulk of ore, and then to bring it into contact with the volume of gases required to complete reduction. This led to a gradual increase in the height of stacks as the output was increased. Experience seems to show quite clearly that, for Mesabi ores, the proper height is 90 feet.

A greater height of the stack than that necessary to accomplish the desired reduction is not only useless, but detrimental by extending the zone where the coke is attacked by CO_2, and unnecessarily increasing the blast pressure. Furnaces which are too low compared to their hearth diameter have too low a blast pressure to give a proper penetration in the combustion zone, if driven at the rate most suitable for economical reduction. If higher blast pressure and better penetration are obtained by increased wind volume, the zone of fusion rises and the time available for preheating and reducing the ore charges becomes too short, resulting in an excessive proportion of direct reduction by solid carbon. Furnaces operated in this manner are able to produce as large or larger, tonnage than similar stacks of greater height, but will invariably show a higher fuel consumption. The practice of carrying the stock-line at a lower level has the same effect—the tonnage is increased at the expense of fuel consumption, except where the furnaces are too high, in which event they should be cut down rather than jeopardize uniform distribution and life of lining.

The diameter of the stock-line should be carefully chosen to correspond with the hearth and the prospective volume of wind. It should not be appreciably smaller than the hearth, otherwise the dust loss when using fine ores will be excessive. Neither should it be materially larger, as it would be difficult to obtain the desired batter of the inwall without extending the cylindrical top section too far down, or inserting too high a cylindrical section above the bosh, both of which are liable to interfere with the smooth travel of the stock. The stock-line approximately determines the size of the bell. With Mesabi ores a bell of from 3 to 5 feet smaller diameter than the stock-line has given the best results. The method of charging has some influence on this relation.

The number of tuyeres, if kept within certain limits in proportion to the size of the hearth, is of little importance, since not their number but their combined free area determines the degree of penetration with a given wind volume. At the South Works 10 and 12 tuyeres are used with equally good results on the largest hearths.

The relative position of the tuyere level, cinder notch and tapping hole deserve the most careful study. By increasing the height of the tuyeres above the cinder notch, a larger amount of slag can be held and the clogging of the tuyere zone with slag, which interferes with the combustion, is prevented. The greater the distance between cinder and iron notch levels, the smaller the danger of the iron reaching the cinder notch and causing damage. With a fixed hearth diameter, this distance determines the maximum weight of individual casts. However, it cannot be increased except in proportion to enlarged output, otherwise the bath of iron, removed too far from the active tuyere level and held too long in the furnace, will cool and cause those manifold troubles due to physically cold iron, which affect furnace and steel works practice alike.

Since the character of the ores is changing all over the world, much in the same direction as in this country, the development of furnace lines in other countries will in all probability be similar.

Having established suitable lines, the next problem is to maintain them.

Nothing contributes so much to the long life of a lining as a low fuel consumption and uniform practice. The hearth and bosh, which in the early days usually determined the length of a campaign by giving way first, are on our modern furnaces so efficiently cooled and so strongly armored that they outlast the lining in the stack. The ability to maintain the bosh indefinitely, by the insertion of cooling plates, led to many attempts to follow the same construction in the inwall. But the plates

caused the lining to become corrugated between rows and to wear back above the top row, forming shelves highly inducive of scaffold formation. Furthermore, it was not an easy matter to so arrange the plates that they could be exchanged when leaking. Cooling plates above the mantle have only survived where they are placed from 18 to 22 inches back of the face of the inwall, and in this position they have not much effect in preserving the original lines. These difficulties led to the construction of thin lined furnaces on both sides of the water, from 9 inches and 13 inches of brick work in this country, and from 3 inches to a mere coating of clay used on a few German furnaces. Very thin linings have only proved advantageous for making special grades of iron or when using coarser burdens. With Mesabi ores it is impossible to prevent the fine materials from building up on the cold shell, after the lining is worn away. Therefore the life of a thin lining is determined by the life of the brick work itself, and this is too short in the case of a 9-inch or 13½-inch lining to make this construction profitable.

Excessive thickness of a lining has no advantage, since before it wears out, the lines become so irregular that economical practice is impossible. From 22½ to 36 inches seems, therefore, the proper thickness. A good lining, if allowed to become properly seasoned and coated will wear slowly and uniformly, providing the stock and blast distribution is correct. A stack lined with a moderately thick lining does not require water cooling, but when the brick work does wear, the campaign can be prolonged by the application of water sprays without much deviation from the original lines.

The quality of the fire brick is the next important item in prolonging the life of a lining. The hearth and bosh brick are protected by efficient cooling; the top brick generally by wearing plates. The problem is to obtain brick for the lower inwall which will last without protection. Here they are exposed simultaneously to abrasion and high temperatures. They must therefore, have a high melting point and yet be hard and tough. The quality of clays and their treatment, as well as the various methods of brick manufacture, enter here. Machine-pressed brick are especially well adapted to meet the requirements of a good inwall, and owing to their correct shapes can be laid with narrow joints. They have given excellent results at the South Works during the past five years, from 600,000 to 800,000 tons of iron being obtained on a lining, and with good practice to the end. In Germany carbon brick are frequently used in the hearth and bosh, with varying results and opinions widely differing as to their value.

A great variety of wearing plates have been designed to protect the stock-line, but very few have proved successful. The plates should be made in small enough sections and of such metal and design that they will neither crack nor warp. To prevent their working loose and interfering with the distribution, they should be tied in with the brick work. Some furnace men prefer to avoid the complication of such arrangement by repairing the brick work at the stock-line during the campaign.

Skip Bridge Should Not Rest on Shell

The strong, riveted, steel plate shell surrounding the brick work is one of the best features of our construction. It is now made so heavy that the lining can be laid quite close against it, insuring tight joints, which are forced to close with the expansion of brick work. The shell may serve the purpose of supporting the top ring, hopper and downcomer pipes; but the skip hoist and dumping mechanism should under no circumstances be attached to it. These must be supported independently to avoid shifting with the expansion of the furnace. The furnace shell protects the brick work and allows weak spots in the lining to be held for long periods by the application of water sprays. In Germany furnace shells are found only exceptionally and on older furnaces. The construction commonly used there encircles the brick work with steel bands. Many stacks are cooled, sometimes up to the top, by open cast iron water boxes which are placed between the bands and generally extend to within a few inches of the interior face of the lining. For this construction is claimed the advantage of accessibility when repairs to the brick work are needed. In some instances German stacks have been practically relined without blowing out, by banking below the mantle. The furnace with a steel shell is certainly stronger and safer, and can be kept in blast under conditions which would force an open furnace out of operation. Our practice would seem to prohibit the German construction on account of high blast pressure, loss of gas and danger of ruptures in case of heavy slips. In the bosh where we employ the German stack construction, they often use a steel jacket, similar to the one employed in this country on eastern furnaces using magnetites and imported ores. With Mesabi ores the more intense cooling of the water-sprayed jacket causes accumulations to form on the bosh, which periodically melt down, making the practice very irregular.

The gas off-takes should be located as high above the stock-line as possible, out of the path of the falling stock. There should be several, preferably four, and their area should be sufficient to prevent excessive velocity. In this manner, and by turning these off-takes upward before they lead down to the dust catcher, the amount of flue dust and fine coke carried over has been decidedly reduced. One or more good safety bleeder valves should be provided, so designed that they will give ample relief during heavier slips without allowing any coarse materials to be thrown out.

The dry gas cleaning system need only consist of one dust catcher of good size and an efficient centrifugal cleaner. These will eliminate practically as much dust as more elaborate arrangements, and are economical in construction and operation. A primary gas washing plant of sufficient capacity to wash all the gas for stoves and boilers should form part of every modern furnace plant. There is no question as to the value of washed gas for stoves, and a proper design of boiler settings, to allow of a free development of the flame and complete combustion before the gases strike the colder surfaces, will render it economical for boilers also.

With washed gas the problem of stove construction becomes comparatively easy. Small checkers can be employed and thereby the heating surface is increased sufficiently so that four large stoves will furnish all the heat required. With clean gas these can be kept in continuous service. They form a simpler layout and are preferable to five smaller stoves on account of better heat economy, less radiation surface and fewer valves.

The latest innovations, which come to us from Germany, claim to increase the capacity and efficiency of existing stoves by using compressed air for combustion, or by installing heat interchangers in the chimney flue for preheating the air.

When using fine ores, strong blowing equipment is essential to insure the delivery of a uniform amount of wind, even under conditions of high blast pressure. Gas engines of good design and liberal dimensions have proven to be especially adapted for

this service, since the cost of blowing is but little affected by high blast pressures, whereas it can be made almost prohibitive in the case of steam engines in districts of high cost of fuel. The great economy of the gas-blowing engines has been a long established fact. Practice in recent years has proved their reliability in service, and has thereby definitely decided in their favor against reciprocating steam-blowing engines, except in a few localities favored by very low fuel costs which, however, are rapidly diminishing with the generally increasing cost of coal mining. The turbo blower is invading these fields, owing to its low cost of installation, the small space it requires and its simple operation.

(To be concluded.)

Elastic and Vulcanite Wheels

BY C E GILLETT

THE FIRST abrasive wheels were natural stones. Their use was limited very largely through the fact that they did not have the physical properties requisite for efficient use on metals, and through want of proper machines and methods of application. The use of an abrasive wheel for grinding metals has always been taken as a fundamentally correct idea and efforts toward the success of this idea are seen first in the hydraulic cement wheels which were made in imitation of the natural stones. These failing even with the hardest of abrasive grains, the second step was the use of organic substances which melt when heated and are hard when cold. The shellac, rosin, sulphur and rubber bonded wheels were tried. Wheels bonded with shellac and with rubber were successful to a considerable degree and have a special field of usefulness today.

Following the organic bonded abrasive wheels there came the silicate of soda and the vitrified or (more correctly speaking) the completely fused clay bonded wheels both of which rapidly gained favor.

Today the metal trades have not only a variety of wheels from which to make selection, but also have highly efficient machines. The development of the grinding machines to their present-day efficiency has played no small part in the history of the several kinds of grinding wheels, and finally in the definiteness of the fields to which each kind is adapted.

To write exhaustively on the fields of use for each of the kinds of wheels now made would require much more space than is available. Even a complete exposition of the elastic and vulcanite fields cannot be had. The present note, therefore, is confined to the defining of the most important fields and this only in general terms for the elastic and vulcanite abrasive wheels.

As the trade recognized the freer and cooler cutting qualities of vitrified wheels on practically all grinding operations in the iron and steel industries, the elastic and vulcanite wheels were slowly but surely superseded. They were not and probably will not be eliminated altogether, since there is a field wherein their particular properties make them peculiarly efficient and where a vitrified wheel can never successfully compete.

Method of Manufacture

The elastic bonds are composed of shellac and other gums which completely fill the voids of the wheel. The vulcanite bonds are composed of rubber as the name implies.

Elastic and vulcanite wheels are made by a pressing or rolling operation, and have a very dense structure, the abrasive grains being imbedded in the bonding material. This does not permit of as fast grinding as is possible in wheels of a porous structure containing a considerable number of clearance spaces or voids.

Some manufacturers cover the sides of their cutting off wheels with a coating of fine abrasive grit or sand, to give the appearance of a good close uniform wheel structure. This coating comes off while making the first cut, in fact it can be scratched away with a chip of wood and is of no practical use. However, on thicker wheels this coating on the sides of the wheel is used as a means of bringing the wheels into balance. This practice is not to be recommended, because the varying thickness of the wheel will cause it to run out of truth on the sides.

Clearance in Wheels

The effect of clearance in these wheels has come up at various times, the idea being that such a wheel would prove to be much faster cutting. Therefore, the Norton Co. had a wheel made up which looked like the bottom of a collender, being filled with small holes. This wheel was tested by the mechanical laboratory, where it was found to cut fast and with a small wheel wear, working as smooth as a regular wheel. It was felt that, while these holes allowed room for the chips to be carried away, making a more free and uniform cutting wheel, that as much good was received by the cooling effect. That is, the clearance spaces or holes allowed a circulation of the air through the wheel which kept the wheel cool, preventing the bond from softening and also prevented knocking taking place. However, if the proper grain and grade of wheel and the correct wheel speeds have been selected there is no decided advantage in using a clearance wheel of this type.

The elastic bond has a limited range of grades, a high tensile strength and considerable elasticity. The vulcanite or rubber bond has the general characteristics of the elastic bond, but its grade, or degree of hardness, cannot be varied as extensively and, therefore, its uses are more limited. Advantage is taken of this property of elasticity to make very thin wheels.

Elastic and vulcanite wheels are made as thin as 1/32 inch up to 4 inches diameter, 1/16 inch thick up to 8 inches diameter, and 3/32 inch thick up to 12 inches diameter. Wheels of very fine grit and small diameter have been made as thin as 1/64 inch. Solid, elastic wheels are being made commercially as large as 26 inches diameter and 2 inches thick, while vulcanite wheels are being made 16 inches diameter and 2 inches thick.

The thin wheels are used for slotting and cutting off stock. Tubing, pipes, wire, thin sheets of steel or brass, in fact most materials which are difficult to hold for cutting by regular tools are cut off very easily and efficiently by these wheels.

The thicker wheels are used for saw gumming, grinding between the teeth of gears, sharpening molding cutters, wood-working tools, etc. They are also used for cutlery work, and roll grinding where a very smooth polished surface is desired.

Elastic and vulcanite wheels can be safely run in water. Elastic wheels

(Continued on page 1024b)

We are indebted to the courtesy of the Norton Co., Worcester, Mass., for the use of this article.

Brilliant Banquet at the Close

Of the Convention of American Iron, Steel and Heavy Hardware Association—San Francisco Selected for Next Meeting—The New Officers

The last event of the convention of the American Iron, Steel and Heavy Hardware Association held in Cleveland last week, was the banquet Thursday evening at the Hollenden. Hon. Warren G. Harding, ex-lieutenant governor of Ohio and candidate for the United States Senate, said in the course of his eloquent address that art and literature flourish to the greatest extent only when there is great commercial progress. This fact was elaborately illustrated by the banquet, in the art displayed not only in the preparation of the menu, but also in the elaborate floral decorations, in the exquisite taste of every detail of the arrangements and even to a greater extent in the able responses to the toasts. The scholarly address of John Kendrick Bangs, the highly polished speeches of the toastmaster, Homer H. Johnson, ex-president of the Cleveland Chamber of Commerce and the happy addresses of Col. H. P. Bope, vice president of

E. W. A. WATERHOUSE,
President, American Iron, Steel and Heavy Hardware Association

The Carnegie Steel Co. and William P. Palmer, president of The American Steel & Wire Co. demonstrated how commerce, art and literature advancing together mark the progress of a great nation.

"The most urgent demand today is for more employment for American workingmen to swell the stream of American commerce and insure a fair return for American capital," said Mr. Harding. Speaking with great earnestness to the assembled business men, he declared he would say to them as he had said to many other business organizations: "You are to blame to a very large extent for the corruption of American politics. Representative government itself has been called into question in the country because you have not exercised your civic duties. Honest business must come to an understanding with popular sentiment, and business men must do their full share in public service. Honesty is individual."

Mr. Palmer spoke in a very informal way, blending a delightful humor with serious thoughts. He discussed the extravagance of the American people. He said that not a great many years ago, he was carrying his lunch to his place of employment. In those days, people went to market. Now, he said, the market basket has almost disappeared from the home and the delivery wagon has taken its place. On every side, there is evidence of the increased cost of living.

Col. H. P. Bope said that he did not intend to talk business. He referred only briefly to the present depression, saying that the American people could not stand still and that when the honesty of American business men shall be recognized by those in official positions, real prosperity will be established. Col. Bope then traced the advance of women from the days when they were chattels to the present time. His peroration was an eloquent tribute to women.

John Kendrick Bangs made an extended address fully up to his high standard of eloquence and humor. He expressed a hope that to some extent he might be considered an antidote to unnecessary muckracking.

The banquet was in charge of Samuel D. Latty, chairman assisted by W. A. Comstock, H. G. Smith and H. F. Seymour. For the first time in the history of the association, ladies were present at the banquet and the opinion enthusiastically expressed, was that their presence added greatly to the enjoyment of the convention. The entertainment of the ladies during the three days of the convention was in charge of a committee with R. M. Kilgore as chairman, and included a luncheon at the Country Club Wednesday and a musical Wednesday evening. The ball en surprise Tuesday evening in charge of R. S. LeBarre, chairman, was one of the most thoroughly enjoyed features of the week. Among those who added greatly to the success of the convention were J. A. Gregg, chairman general entertainment, Norris J. Clarke, chairman and Miles J. Ewing secretary of Cleveland committees, R. S. Hall, chairman of finance committee, A. T. Morrison, chairman of reception committee, John C. Chandler, chairman of music committee, George N. North, chairman of information and credential committee and D. S. Guthrie, chairman of press committee.

Points from President Palmer's Speech

A ten-billion-dollar crop will knock out the pessimism of this country.

The only busy industry in this country just now is the lawyers'.

In the old days, business men did the best they could with the light they had.

The law used to be, do not kill your competitor. Now it will not even let us help him.

If I don't miss my guess, the tariff will be revised upward before it is revised downward.

If wages keep on advancing and prices falling, what is to become of the manufacturer?

There is a great deal of talk about regulating selling. What we want is to regulate buying, so that there will be more of it.

Optimism pays in the long run; at least, it is more comfortable.

Contracts Discussed.

Col. H. P. Bope, vice president and general sales manager of the Carnegie Steel Co., was one of the speakers in the discussion following a paper read by Samuel L. Sewall, of the Minneapolis Iron Store Co., Minneapolis, Minn., on "Contract Relations Between Manufacturers and Distributors." Mr. Sewall spoke with earnestness in favor of strict enforcement of purchase contracts by both buyer and seller, and favored the elimination of the so-called "jughandle" contract which amounts to little more than an option on a portion of the manufacturer's output and

results in considerable tension between the parties when deliveries are slow.

Colonel Bope, who opened the general discussion, said in part:

Tendency is to Oversell.

"I am free to confess the tendency in the steel business has been to oversell. A maxim used to be, 'Sell and repent afterward.' When we find ourselves in this predicament, it is our aim to treat every customer as justly as we can, although no customer seems to understand why his order shouldn't be filled at once regardless of the other orders we are striving to complete. If we have to favor anyone, we favor the man who needs the material most, that is, the man who would have to shut down his shop if he didn't have the iron or steel. We take these things into consideration and make substantial sacrifices to help our customers, for we have found that the only way to do business is to treat everyone honestly, fairly, intelligently and justly; because, with the rapid growth of various industries under enlightened management the man who asks for 1,000 tons today may want 10,000 tons tomorrow and 100,000 tons in the course of a few years. The phenomenal growth of business since we have been in the field is a thing we have not always been able to anticipate and prepare for.

"I know that our present contract form is not perfect but I believe it is as near perfect as any yet. By it deliveries made in any month are based upon a price fixed for that particular month. We meet our customers on say the twentieth of every month and set a price for the coming month under which all contracts must come. This takes a little time, but it is the most satisfactory way in the long run, and will be as equitable, I believe, for contracts running through a number of years as for contracts covering a few months."

A paper on "The Cost of Doing Business", by W. A. Kemmerer, of Bittenbender & Co., Scranton, Pa., considered the separate divisions of accounts, showing what economies were practical in each. He urged the great importance of distributors being fair to each other as competitors in conflicting territory and deplored methods whose only result is the cutting of profits. Regarding economy, he said more businesses have been ruined by economy than by extravagance, for the reason that false economies, which are very hard to detect, are the worst kind of extravagances. He advanced the idea that the time to effect economies is when the firm has much money rather than little and that economies should never be practiced at the expense of the good will or confidence of one's trade. Reports were made at this meeting by the horse-shoe, bolt and nut and iron and steel committees.

The New Officers.

Thursday afternoon, the association elected E. W. A. Waterhouse, of Waterhouse & Lester Co., San Francisco, president for the ensuing year. J. A. Gregg, of Nichols, Dean & Gregg, St. Paul, Minn., was elected first vice president, and Charles E. Lewis, of C. C. Lewis Co., Springfield, Mass., second vice president; Henry Bodevin, of N. Langler & Son, Brooklyn, N. Y., and E. F. Yarnelle, of Mossman, Yarnelle & Co., Fort Wayne, Ind., were added to the executive committee. At a special meeting of the executive committee John G. Purdie of New York City was re-elected secretary-treasurer. San Francisco was selected for the next place of meeting.

Wednesday afternoon many of the delegates and their friends were guests of the American Steel & Wire Co. at a moving picture exhibition in connection with the Cleveland Electrical Exposition at the Coliseum, entitled "Through the Factory to the Farm," showing the manufacture of wire products from the time the ore is taken from the mine.

Wednesday evening, H. Russell Brand, of the International Society for the Development of Business Control, New York, delivered an address illustrated with stereopticon views showing the application of his general business theories to the hardware business.

A Popular Innovation

EDITOR THE IRON TRADE REVIEW:—

When a husband and wife are genuinely companionable, they double each other's joys and halve each other's sorrows. Such a beautiful and frank understanding follows that kind of a relationship that there is no marital unhappiness and divorce is unknown. Their domestic life presents an enviable picture and the little children in the home are daily influenced by the sweet and frank atmosphere which pervades it.

High-grade men, whether they follow professional or business pursuits, recognize these facts. The banquet (unequalled in its appointments) given by the Iron, Steel and Heavy Hardware Association, and to which for the first time in the history of the association the wives were most cordially invited, gave an opportunity for good fellowship and real companionship. Every speaker referred, in happy phrases, to the presence of the ladies and we ladies believe they were sincere. Even the souvenir candy boxes carried a word of delightful welcome to the lady guests. The newly-elected president, Mr. Waterhouse, predicted that never would a banquet of the association be held without the ladies.

The fortunate ladies who attended the banquet appreciate the compliments and one, at least, expresses her gratitude herewith.

"AMONG THOSE PRESENT".

German Makers

May Build Specialized Steel Works in America

Reinhold Becker, director general of the Becker Steel Works, Willich, Germany, arrived in the United States May 26, to give direct study to a proposal to erect a branch of the German works in this country, which has been under consideration by this company. Herr Becker plans to spend some weeks in the United States, inspecting sites and examining local conditions preparatory to making a report to his associates in Germany upon which final action in the matter will be based. The Becker Steel Works is a manufacturer of special and high grade steels and has been selling its product in this country since about four years ago, when it incorporated in New York State, a subsidiary interest under the title of the Becker Steel Co. of America, with headquarters at 90 West street, New York City. The company has been marketing in this country large quantities of seamless tubes, automobile steels, spring steel, high speed steels and other special steels. If a plant is erected in this country, it probably will give especial attention to the making of a new high speed steel, recently developed by the company. Steel making at the Becker works at Willich, is conducted by the crucible and electric furnace method and it is proposed that the plant under consideration for this country will follow this line of production.

Granted Leave

To Take Vacation Without Pay—The Ford Way

When operating under complete force, Detroit motor car manufacturers employ approximately 65,000 men; at the present time it is not believed the factories are furnishing employment to more than 50,000 persons, and for several weeks during the coming summer 30,000 automobile workers will be out of employment. The motor car factories have begun curtailing forces. Only a few days ago, the Ford company suspended 5,000 workmen and the company has posted notices to this effect:

> In the regular course of business, we have reached the slack or quiet season.
>
> In line with our policy to be just and fair to the individual employe, we have planned as follows:
>
> Employes will be given a leave of absence without pay, or, if you please, laid off for a period of 30 days.
>
> If, during the leave of absence or "laid-off period", the employe can find other employment, the company recommends that he do so.
>
> If, at the end of 30 days, our men have found no other employment and desire to return to work, they may apply and the company will endeavor to find employment for them.
>
> Ford Motor Co.

The "period of inactivity" in the automobile game in Detroit was expected. Yearly at this time the manufacturers lay off thousands of laborers while the work of stock-taking and the getting out of new models is gone through with. There isn't a concern in Detroit, either in the direct work of manufacturing motor vehicles or in the automobile accessory business that is not cutting its force of workmen and the active period will not begin until September, or in the late weeks of August.

Chemical Engineers Will Meet

The sixth semi-annual meeting of the American Institute of Chemical Engineers will be held at Troy, N. Y., June 17, 18, 19 and 20, with headquarters at the Hotel Rensselaer. The meeting will be held at the Pittsburg building of the Rensselaer Polytechnic Institute and will be devoted to the presentation of papers dealing with the application of chemical processes in manufacturing pursuits. Inspection of the laboratories of the Rensselaer Polytechnic Institute and of various manufacturing plants in the vicinity will be made. Among the plants to be visited will be those of the General Electric Co., of the Burden Iron Works and others. An excursion will be made to the United States Arsenal, where the manufacture of heavy guns will be inspected. Several social features, including dinner, smoker and luncheon, are part of the program.

Water Supply

For Tidewater Blast Furnace Plant is Sought

To provide a fresh water supply for blast furnaces and possibly for other iron or steel manufacturing plants on New York tidewater, Witherbee, Sherman & Co., 2 Rector street, New York City, Port Henry iron ore operators, have filed application with the State Water Supply Commission of New Jersey, for the use of the discharge of some of the streams nearby Boynton Beach and Sewaren, N. J., located on the inner waterways of New York harbor. As previously published, Witherbee, Sherman & Co. and associates have under option a large site at Sewaren and Boynton Beach and gradually are maturing plans for blast furnaces and probably other manufacturing capacity. The company has submitted to the state commission a proposed system of storage and utilization of the fresh water discharge of the Woodbridge Creek above the road from Woodbridge and Sewaren and of the south branch of the Rahway river, which it is calculated fully would supply the requirements of a large plant. Public hearings upon this application were held June 2 by the State Water Supply Commission at the Rahway Hotel, Rahway, N. J., and at the Woodbridge Hotel, Woodbridge, N. J.

Will Add Plate Mills

The Jones & Laughlin Steel Co., Pittsburgh, plans to add eight additional tin plate mills to its tin plate plant at Aliquippa, Pa., which will make that plant the largest tin plate plant in the country. When present plans are completed, the plant will contain 32 tin plate mills.

The A. Garrison Foundry Co., South Side, Pittsburgh, a pioneer manufacturer of rolls, has completed another large roll for the Otis Steel Co., Cleveland. The roll, which will be used in the plate mill, is said to be the largest ever made in this country. It weighs 71,000 pounds and is 152 inches long and 42 inches in diameter.

Iron and Steel

Will Have Prominent Part in Testing Society Meeting

The seventeenth annual meeting of the American Society for Testing Materials will be held at Atlantic City, N. J., June 30 to July 3, with headquarters at the Hotel Traymore. The nominees for officers are as follows: President, A. W. Gibbs; second vice president, A. A. Stevenson; secretary and treasurer, Edgar Marburg; members of executive committee, Robert Job, F. W. Kelley, A. Marston and S. S. Voorhees. Mr. Gibbs is general superintendent of motive power of the Pennsylvania railroad, Altoona, Pa., and Mr. Stevenson is vice president of the Standard Steel Works Co.

The first meeting, to be held Tuesday morning, June 30, will be devoted largely to committee reports and Tuesday afternoon non-ferrous metals will receive attention. The annual address of the president will be delivered Tuesday evening. The fourth and fifth sessions will be devoted to steel, as follows:

Fourth Session, Wednesday, July 1, 10 a. m.

Report of Committee A-1: On Standard Specifications for Steel. C. D. Young, chairman.

Report of Committee A-4: On Heat Treatment of Iron and Steel. Albert Sauveur, chairman.

Report of Committee A-8: On Standard Specifications for Cold-Drawn Steel. C. E. Skinner, chairman.

Report of Committee A-6: On the Magnetic Testing of Iron and Steel. C. W. Burrows, chairman.

Magnetic Habits of Alloy Steels. J. A. Mathews.

A Failed Axle: Investigation of an Internal Transverse Fissure. Robert Job.

Uniform Hardening of Steel. Albert F. Shore.

Fifth Session, Wednesday, July 1, 8 p. m.

Report of Committee A-3: On Standard Specifications for Cast Iron and Finished Castings. Richard Moldenke, chairman.

Some Notes on Chilled Cast Iron. E. B. Tilt.

Report of Committee A-2: On Standard Specifications for Wrought Iron. S. V. Hunnings, chairman.

New Vibratory Testing Machine and Results Obtained by Its Use. S. V. Hunnings.

Report of Committee D-7: On Standard Specifications for the Grading of Structural Timber. Hermann Von Schrenk, chairman.

Report of Committee E-4: On Methods of Sampling and Analysis of Coal. S. W. Parr, chairman.

The subjects for Thursday will be lime, ceramics and road materials, and on Friday the subjects will be preservative coatings and testing apparatus and methods.

The Calumet Steel Co. has removed its Chicago office to suite 1821 new Continental & Commercial National Bank building, 208 South La Salle street.

Needs Help

From the Government to Boost Railroad Buying

Toronto, June 1.—The proposal to guarantee the bonds of the Canadian Northern railway by the Canadian government, now under consideration by parliament and practically sure of adoption, will have an important effect on the iron and steel industries. For some years, activity in the trade has been stimulated by the large volume of railroad construction and equipment. This has latterly fallen off greatly on account of financial stringency. The Canadian Northern is heavily burdened with debt and unable to contract further loans without the government guarantee having floating liabilities to the amount of some $10,000,000 to contractors and others, which in the meantime it is unable to meet. Plans had been made for the expenditure of about $6,000,000 in the west this season on its transcontinental line and branches, but the work could not be proceeded with for lack of funds. When the bond issue is disposed of, a large amount of money will be put into circulation and a portion of the program carried out. The iron and steel interests believe that the resumption of activity by the Canadian Northern will do much to relieve the present situation by creating a demand for construction material and railway equipment and by restoring confidence. The Canadian Northern is closely involved with important financial institutions which might be imperiled unless the government came to its relief, so that the proposed guarantee is regarded as practically the only alternative to a serious financial crisis.

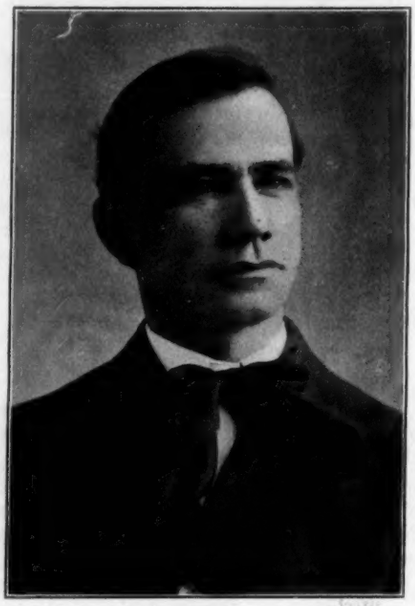
President Plummer Explains

At the annual meeting of the Dominion Steel Corporation at Montreal on May 28, President J. H. Plummer, speaking in explanation of the financial statement (the figures of which have already appeared), said that the decrease in earnings amounting to about half a million dollars had been a great disappointment. The steel business collapsed early in November, and from that time the plant was kept in partial operation, and that chiefly on export business. The coal business also failed in part and the results for the last quarter of the year were very meager. The interest on expenditures on construction work had been borne by earnings, and in repairs they had done what was necessary to maintain the plant in a sound condition and improve its capacity and efficiency.

"Our only complaint is that we have had few orders and that prices have been cut down by keen competition. It is suggestive of the difficulties that exist in this respect that during this spring wire and nails were exported from the United States at lower prices than the wire rods from which they are made."

A Fighting Lawyer

Attorney Frank Lyon, of Washington, D. C., who has just been retained by the Ironton-Ashland Manufacturers' Association to represent furnace interests of southern Ohio districts in the general investigation by the Interstate Commerce Commission into ore rates to Ohio, West Virginia and western Pennsylvania, is prominent in rate contests. Recognition of his ability is well voiced by his retention in this important ore rate hearing which will be heard next fall. The selection of Mr. Lyon follows his success in numerous big cases before the commission. He served about 25 years with the commission, for a long time as examiner and counsel before that body. Proceedings in the rate advance case of 1910, when the carriers' application was denied, were conducted by Mr. Lyon on behalf of the commission. He also had charge of the investigation as to the increase of coal rates from West Virginia fields to the lakes.



FRANK LYON

Resigning from the commission in the summer of 1912, he became associated with the Chicago and Milwaukee pig iron interests in the Sloss-Sheffield case, involving pig iron rates from the Birmingham, Ala., district to points north of the Ohio river and east to New England. Decision in this case is expected now at any time. Mr. Lyon also represented the Newport Mining Co. in the litigation protesting against an increase of rates from Michigan iron mines to upper lake docks.

When eastern carriers asked for an increase of rates in 1913, Mr. Lyon was retained by the Pittsburgh Coal Co. to oppose the increase as applied to coal.

Orders for Mesta

The Pennsylvania Steel Co. has awarded contracts for part of the equipment included in extensive improvements under way at its plant at Steelton, Pa. The Mesta Machine Co., Pittsburgh, has received an order for a 44-inch, two-high blooming mill, including reversing tables, manipulators, etc. The mill has a number of special features of which the most important is the couplings, provided with the new type Mesta universal joint. Table gears are fully enclosed. This equipment will weigh 2,500,000 pounds.

Lose Rate Case

Buffalo district blast furnace interests again have lost in their effort to have the Interstate Commerce Commission make a reduction in the coke carrying rate of $1.85 per ton from the Connellsville region to the Buffalo district.

The Commission says no reason has been shown why it should depart from its original finding.

Wrecking Docks

The Gordon Iron Co., Chicago Heights, Ill., has purchased two large coal docks from the Clarkson Coal & Dock Co. at Duluth and is now wrecking them. The company makes a specialty of wrecking with quick service.

The Knox Motors Co., of Springfield, Mass., has been chartered with a capitalization of $2,500,000, consisting of 12,500 shares of 6 per cent cumulative preferred and 12,500 shares of common stock. The incorporators are E. O. Sutton, H. G. Fisk and C. H. Beckwith, all of Springfield. The new company will take over the manufacturing plant of the Knox Automobile Co., which recently went into bankruptcy.

TIPS FOR NEW BUSINESS

Equipment needs of the Iron and Steel works, Machine shops, Foundries and other Metal Working plants

In New York, the most important recent event in the machinery market is the closing of a list by the New York purchasing agent of the Oregon Short Line. This involved a limited number of machine tools for delivery to the shops at Pocatello, Idaho. The outlook has improved somewhat by reason of the greater interest in their requirements which is manifested in a quiet way by the eastern railroads. There is some promise that a fairly good buying movement may develop shortly from this source. The volume of business continues small and direct inquiries are not of large extent. The Taylor-Wharton Iron & Steel Co., High Bridge, N. J., has issued revised specifications for bids on 15 cranes to be purchased for its new plant at Easton, Pa. Foreign demand for American machinery continues rather dull. The second-hand machinery market is moving along rather slowly.

In Cincinnati, all efforts of sellers to produce a better feeling in the machine tool market during the past month have evidently failed, and business today is very quiet and unimproved. The month of May will probably show a slight decrease in comparison with April. The best month, as far as sales are concerned since the first of the year, was March. Demand is limited mostly to lathes, milling machines, metal-bending and woodworking machinery. Second-hand machinery is dull, but it is slightly better than new machinery. Refrigerating equipment is in fair demand and small electrical equipment is holding its own, being fairly satisfactory. Foundries are barely operating, owing to the lack of orders for machine tools.

EASTERN STATES

ASHBURNHAM, MASS.—The Almond Co. has been incorporated; manufacturing machinist; $950,000; by C. A. Hubbell, H. S. Hubbell, Ashburnham.

BOSTON.—Hawkridge Bros. Co., manufacturer of "Hawk-Vanadium" tool steel, will build a warehouse adjoining its plant in Wesley street. The building will be 40 x 60 feet and 22 feet high, of fireproof construction. The front of the building will be occupied by offices.

NEPONSET, MASS.—The plant of the Coffin Valve Co., was visited by fire May 18. Although the flames were confined to one department, the loss amounted to about $5,000, as a good many valuable patterns were burned.

ROXBURY, MASS. — The Holtzer-Cabot Electric Co., which began to manufacture electrical goods in 1875 with 8 or 10 employes, and whose pay-roll now numbers about 800 names, has broken ground for the erection of a large new plant on Armory street. The new factory will be of concrete, five stories and will provide work for more than 1,000 men. It will be completed before the end of the year. The company's present plants, one in Brookline, Mass., and three in Boston, then will be abandoned and the operations concentrated at the new location. The company makes electric motors, telephones, electrical sundries and automobile accessories.

WORCESTER, MASS. — The Union Twist Drill Co., plans additions to its plant; plans with Frost & Chamberlain, Slater building; ready for figures now.

SOUTHINGTON, CONN.—The Clark Bros. Bolt Co., is making plans for an addition to its plant; Edwin S. Todd, secretary.

BUFFALO.—The U. S. Smoke Eliminator Co. has been incorporated; consumers' fuel economy devices; $50,000; by C. D. Ream, H. T. Cooper, C. H. Weiss, Buffalo.

BUFFALO.—Ground has been broken for the proposed plant of the Buffalo Metal Goods Co. to be erected on a site facing Winchester and Fillmore streets; estimated cost, $20,000.

JAMESVILLE.—Zenith Wire Co. has been incorporated $100,000; by H. Hoatling, W. A. Beattle, H. V. Rulison, Syracuse.

MIDDLETOWN, N. Y. — The Orange County Lighting Co. has plans almost complete for its proposed gas plant to be erected between the Erie and O. & W. tracks on Genung street; T. W. Davey has charge of installing pipes.

NEW YORK. — The Hausermann Metal Mfg. Co. has increased its capital stock from $90,000 to $135,000.

NEW YORK.—The Enterprise Smelting & Refining Co. has been incorporated; $5,000; by L. J. and J. Jacoves, I. B. Novegrod, 1461 Forty-first street, Brooklyn.

NEW YORK.—The Marshall Bros. & Griffen Mfg. Co. has been incorporated; machines, tools; $25,000; by S. S. Newton, W. R. Baird, C. G. Campbell, 11 West Eighty-eighth street.

SYRACUSE, N. Y. — Gooley & Edlund, manufacturer of mill machinery here will erect a plant in Cortland. The company expects to start operations in its new plant about August 1.

ERIE, PA.—Contract for the erection of the freight warehouse terminal of the Erie & Pittsburgh railroad by the Pennsylvania Co. has been awarded to Geo. B. Swift & Co., of Chicago. The house is to be finished in three months. The building will be 40 x 408, steel reinforced. Construction cost is placed at $27,500.

ERIE, PA.—Charter for the Erie Construction Co. was granted at Harrisburg this week. The capital stock is placed at $30,000. The company is made up of local manufacturers and street railway men with the main purpose of building an electric railway from Erie, through the south-eastern part of the county, making more satisfactory freight and passenger connections with the Erie Railway main line between Waterford and Union City.

FARRELL, PA.—The Carnegie Steel Co. is receiving bids and will award contracts within the next two months for the proposed benzol plant to be erected as an adjunct to its by-product coking plant. The plant will not be completed before January, 1915.

PITTSBURGH.—Pipe Coiling, Bending & Welding Co. has been incorporated; $25,000; by George Best, G. H. Best, Oakmont; and H. W. Jacobs, Pittsburgh.

CENTRAL STATES

CINCINNATI. — The H. Ley Co. has been incorporated; structural iron and steel; $5,000; by H. M. Ley, Flora Ley, Henry Ley and Pearl Ley.

CINCINNATI.—The Nowata Oil & Gas Co. has been incorporated; developers; $60,000; by J. B. Foraker Jr., J. Sagmeister, J. W. Heintzman, E. G. Kinkead, and William Stevenson.

CINCINNATI. — The following contracts have been let by Tietig & Lee, architects, of Cincinnati, for an addition to Christ hospital, that city; concrete and reinforcing, to the Ferro Concrete Construction Co., Cincinnati, which will require slightly over 100 tons of reinforcing bars; iron and steel, to the Columbia Iron Works, Cincinnati, requiring about 200 tons of structurals.

CLEVELAND.—Bids will be received at 513 City Hall until noon, June 11, for a concrete mixer for the water department; also for three centrifugal boiler feed pumps.

CLEVELAND.—Bids will be received until June 3 at 513 the City Hall for 400 feet of 48-inch riveted steel pipe; proposals must be entered on blanks furnished by the water commissioner.

COLUMBUS, O. — The King Thompson Co. which has the development of the 1,000-acre Miller farm, has begun grading streets; sewers, gas, electricity, sidewalks and city water will be put in all streets.

DAYTON, O. — The Henry Burkhardt Packing Co. plans to erect a $100,000 steel and concrete building on South Market street near Jefferson.

LIMA, O.—The council has recommended a 2-span bridge for Pine street, steel plate girder type, 190 feet long and 40 feet wide.

MASSILLON, O.—The Self-Locking Clamp Co. has been incorporated; $10,000; by Samuel Mollet, L. J. Mollet, George W. Bennett, C. L. Mollet, O. M. Mollet.

MASSILLON.—The National Sanitary Co. has been incorporated; enameled ware; $500,-

000; by Fred H. Snyder, Louis P. Mauger and Richard Johnson.

MT. GILEAD, O.—C. O. Higgins, county auditor, will open bids June 19 for superstructure and substructure of Marengo bridge and Chesterville bridge, each 82 feet long; plans with auditor; certified check for $500 and $100 respectively is required.

PORTSMOUTH, O. — Henry T. Bannon states that the Chesapeake & Northern railroad is receiving bids on its proposed $2,000,000 bridge to be erected across the Ohio river. Bids will be opened in New York City, June 11.

TOLEDO, O.—Charles Sanzenbacher, auditor of Lucas county, will open bids June 23 for a culvert and approaches in Adams township, for bridge and abutment in Jerusalem township, for a bridge and abutments in Trowbridge, for a bridge and abutment in both Monclova and Swanton townships, for a culvert and approaches in Sylvania township; complete plans with county surveyor; certified check for 20 per cent of bids is required.

YOUNGSTOWN, O.—Judge V. P. Barnum has ordered Erie railroad officials to submit amended plans for the elimination of grade crossings here at once; the work involves $2,000,000 expenditures.

WHEELING.—C. A. Wilcox, Ohio street, Island, is having a large machine shop erected on the hillside just north of West Wheeling near the old traction barns; estimated cost, $15,000.

LOUISVILLE. — The Meyrick Pattern Works has been incorporated to acquire patterns and molds for the manufacture of machinery and agricultural implements; $1,500; by Joseph Meyrick, Joseph T. Killmeier Jr., W. R. Martin.

FORT WAYNE, IND. — Chas. Kenrick, Gary, Ind., is preparing plans for the Indiana Engineering & Construction Co. for an office building of reinforced concrete, two stories, 94 x 65 feet.

INDIANAPOLIS. — The American Machine, Engine & Tool Co. has been incorporated; machinery; $5,000; by Richard Gaul, Alexander Burkhardt, Charles T. Sheets et al.

INDIANAPOLIS.—The Firestone Tire & Rubber Co. plans another addition to its plant located here. This will include a 5 story, 60 x 125 foot extension of a wing of the building, another wing will be extended 140 feet which makes 98,000 square feet additional floor space. A 4,000-kilowatt generator and steam turbine will be installed and the present switchboard replaced by a 70-foot gallery board.

NEW CASTLE, IND.—The Maxwell Mfg. Co. will commence improvements on its plant here; $120,000 worth of mechanical equipment will be installed and additions built by Aug. 1.

TERRE HAUTE, IND.—The Parrott Baking Co., E. M. Parrott, secretary, is taking bids for a bakery building, steel and concrete four stories and basement, 160 x 160 feet, to cost $75,000.

CHICAGO.—The Metal Block Wainscot Co. has been incorporated; metal working and fabricating machinery; $50,000; by Stephen A. Day, 39 South LaSalle street.

CHICAGO. — The Chicago wholesale Products Market Co., A. C. Kibbe, 105 West Monroe street, is having plans drawn for a market building of reinforced concrete and steel, three stories, 90 x 75 feet, to cost $275,000.

CHICAGO.—The Chicago Auto Radiator Mo., has been incorporated to manufacture and repair radiators, fender and auto sheet metal work; $1,500; by Kulman H. Emmerman, Louis Schaffer, Jacob Siegal, 3915 West 15th street.

EAST ST. LOUIS, ILL. — The Excelsior Tool & Machine Co. is starting work this week on an addition to its present plant.

ELGIN, ILL.—Bids will be taken until June 15 by James Dibelka, 29 South La Salle street, Chicago, for a building at the Elgin insane asylum of steel and reinforced concrete, two stories, 35 x 96 feet and 31 x 35 feet, to cost $50,000.

MACOMB, ILL. — Macomb Sheet Metal Works has increased its capital stock from $40,000 to $60,000.

PEORIA, ILL.—The Meyer Furnace & Supply Co., has been incorporated; $25,000; by Dirk Meyer, George F. Meyer and George Harms.

SPRINGFIELD, ILL. — The Wishart Ice Machine Co., has been incorporated to manufacture and deal in machinery, appliances and accessories; $40,000; by John O. Wishart, William Wishart, T. M. Dolan and Elmer Hagler.

DETROIT.—The Masco Mfg. Co. has been incorporated; automobile steering gears; $20,000; by John F. McLaughlin, Grant S. Carroll and James Ulrich.

HANCOCK, MICH. — A 150-foot steel bridge to connect Dollar Bay with Point Mills is under consideration.

MT. CLEMENS, MICH.—The Paulau Steel Spring Co. has been organized to make motor car springs; $75,000 capital stock; officers as follows: president, A. T. Donaldson; vice president and general manager, A. J. Paulau, of Detroit; treasurer and temporary secretary, C. D. Jackson.

APPLETON, WIS.—A. C. Remley, city engineer, has been directed to prepare plans for a new steel bridge at Law street, to be built jointly by the city of Appleton, C. & N. W., C. M. & St. P. and Wisconsin Electric Companies. It will cost about $50,000.

JEFFERSON, WIS. —By consent of the state highway commission, Walter F. Blake, Appleton, Wis., has sold his contract for building a steel bridge over Rock river at Main street to the Worden-Allen Co., Milwaukee. The bridge will be 389 feet long and 25 feet wide. It will cost about $15,000.

KAUKAUNA, WIS.—The Chicago & North-Western R. R. Co., has awarded the contract for the construction of six steel bridges and viaducts in northern Wisconsin to Joseph McCarty, Kaukauna, Wis.

MERRILL, WIS. — The Merrill Iron Works is rushing work on the rebuilding of its foundry and machine shop, which was badly damaged by fire early in May.

MILWAUKEE, WIS.—The Wagner Architectural Iron Works has been incorporated; $25,000; by A. F. Wagner, Anton A. Dreis, William F. Eichfeld; Ernst Von Brissen, Germania building, Milwaukee attorney.

MILWAUKEE, WIS. — A new foundry building costing $7,500 will be erected by the Prime Steel Co. at its Dutcher works, Kinnickinnic avenue, near Mitchell street. A building permit has been granted.

MILWAUKEE, WIS. — The Wisconsin Plumbing & Heating Supply Co., 296-298 Reed street, will erect a foundry and machine shop on Reed street, near National avenue upon a site with 102 feet frontage, just purchased. Work will begin about June 15.

MILWAUKEE, WIS.—An electric traveling crane and considerable new tool and machine shop equipment will be required by Logemann Bros., machinists and engineers, for their new plant at Thirty-second and Burleigh streets, contracts for the erection of which will be awarded within a few days. The main building will be 50 x 200 feet, of steel and cement block construction. The cost is estimated at $15,000. Eugene R. Liebert is the architect.

NEW HOLSTEIN, WIS.—The A. F. Klinzing Mfg. Co., barn equipment, which recently closed a deal to relocate from Fond du Lac, Wis., to New Holstein has awarded the general contract for the construction of its new plant, 75 x 100 feet, 1-story, of concrete, brick and steel, to Walter F. Blake, Appleton, Wis., at $15,000.

PLATTEVILLE, WIS.—Articles of incorporation have been filed by the Galena Iron Works Corporation, capital stock $60,000. The incorporators are T. M. Priestly, W. V. Parkinson and Edith Marcussen.

RUBICON, WIS.—Charles Fitzgerald, architect, Hathaway bldg., Milwaukee, is preparing plans for a new banking house for the Rubicon State Bank, to be 38 x 40 feet, two stories, with a complete new safe and vault equipment.

SUPERIOR, Wis.—The Cargill Elevator Co., La Crosse, Wis., has awarded to Barnett & Record Co., Minneapolis and St. Paul, Minn., the general contract for the construction and equipment of a 5,000,000 bushel grain elevator and cleaning and handling plant to replace the elevator destroyed by fire two weeks ago. It is to be completed by Jan. 1, 1915.

TWO RIVERS, WIS. — The Hamilton Mfg. Co. is rushing work on the erection of a steel and brick wood furniture factory addition and expects to be able to take occupancy by June 15.

WEST BEND, WIS.—The Gehl Bros. Mfg Co., power ensilage cutter, is about to award contracts for the construction of a new power house, 45 x 55 feet.

KANSAS CITY, MO.—The Packard Kansas City Motor Co. has increased its capital stock from $2,000 to $40,000.

ST. LOUIS.—The Schram Glass Mfg. Co. has increased its capital stock from $500,000 to $600,000.

ST. LOUIS. — The National Refrigerator Co. which will have offices in this city, has just been incorporated under the laws of Illinois with $100,000 capital stock.

MINNEAPOLIS.—The National City Bank, H. R. Lyon, President, is taking primary steps for the erection of a bank building to cost $100,000.

SOUTHERN STATES

HERTFORD, N. C.—May 6 citizens voted $17,000 water works bonds, $12,000 lighting plant bonds aside from an allowance for sewer and street improvements.

DANIELSVILLE, GA.—Bids will be received until June 16 by county commissioners of Madison and Ekbert counties, for constructing a 5-pier, 4-span steel bridge, two 172-foot and two 66-foot spans over Broad river.

LAGRANGE, GA.—Bids will be taken until July 6 for a bridge over Florida Shoals creek; it will have one truss 98-foot span with steel approaches.

MEMPHIS, TENN.—The Automatic Electric Heating Co. has been incorporated; $10,000; by Walter Richmond, R. O. Champion, A. H. Thoda, C. L. Winchester and R. H. Polk.

OKLAHOMA CITY, OLKA. — The Oil Belt Traction Co. has secured a charter to build a line through the main oil belt counties of central and northern Oklahoma; with sidings the line as proposed will be 550 miles long; estimated cost of building, $18,000,000; incorporators are residents of this city.

WESTERN STATES

YUMA, ARIZ.—Bids will be taken by commissioner of Indian affairs until June 15, for a steel highway bridge across the Colorado river.

SEATTLE, WASH.—The city council has voted $500,000 utility bonds in order to complete the municipal car line in Ranier valley.

WALLA WALLA, WASH.—County commissioners have ordered plans for a steel bridge over Touchet river.

DRAIN, ORE.—City has voted $15,000

bonds for installing a municipal lighting plant.

PENDLETON, ORE. — Right-of-way agent for the Oregon, Washington Railroad & Navigation Co. is seeking a site here for shops, roundhouses, yards etc.

CANADA

ST. BONIFACE, MAN.—Bids will be received at the city hall until noon, June 20 for steel superstructure for the Provencher avenue bridge over Red river between St. Boniface and Winnipeg.

HAMILTON, ONT.—The Ford Smith Machine Co., Ltd., has been incorporated; machinery and tools; $100,000; by Percy Ford Smith and S. W. C. Scott.

KINGSVILLE, ONT.—J. C. Pennington is receiving bids on a factory to be erected for the Eco-Thermal Stove Co.

TRADE NOTES

DETROIT.—The Lewis-Hall Iron Works, which will succeed to and carry on the business formerly conducted by Henry B. Lewis, has just been incorporated with $175,000 capital stock. Officers are as follows: President and treasurer, Henry B. Lewis; vice president and general manager, Harry S. Hall, until recently with the Whitehead & Kales Iron Works and W. Howie Muir as incorporator. With its larger capital the company will broaden its field of activity and handle the larger designs of steel structures. It is now fabricating the structural steel for the 14-story addition to the Hotel Tuller, of Detroit.

FOND DU LAC, WIS.—The A. F. Klinzing Mfg. Co., St. Cloud, Fond du Lac county, has been reorganized, interests backing the John Lauson Mfg. Co. at New Holstein, Wis., taking a financial interest. The business is to be moved to New Holstein, where a large building will be erected for its use.

HARTFORD, WIS. — New Kisselkar agencies are announced as follows: Marshall & Johnson, care New Grand Hotel, Salt Lake City, Utah; Chas. Stein, Akron, O.; Marseilles Auto & Supply Co., Marseilles, Ill; Hall & Knight, Lewiston, Me.; E. E. Wentworth, Springvale, Me.; Myers & Lindeberg, Miles City, Mont.; Ely Garage & Supply Co., Ely, Nev.; Hiland Auto Co., 5811 Centre Ave., Pittsburgh; Wolf Auto Co., Watertown, S. D.; E. I. Bowe, Huron, S. D.; Lane Mfg. Co., Montpelier, Vt.; Dixie Motor Car Co., 26 Steger bldg., Nashville, Tenn.; Schweers Hdw. Co. Shawano, Wis.; S. D. Smith, Hoopeston, Ill.; Theo. W. Reed, Manchester, N. H.; A. E. Curtis, Sterling Station, N. Y.; Saskatchewan Garage, Moosejaw, Saskatchewan; Lincoln-Krit Auto Co., Lincoln, Neb.; Victor Garage, Atlantic City, N. J.; E. L. Tibbets, Locke Mills, Maine; David E. Kinsala, Park River, N. D.; C. P. Stearns, Andover, Conn.

LA CROSSE, WIS.—The La Crosse Steel & Construction Co., has been incorporated; $12,000; by George W. Traer, J. F. McDonald and Fred A. Pfeife.

MILWAUKEE, WIS.—The public library board awarded the contract for steel shelving and bookstacks in the main library on Grand avenue, from Eighth to Ninth streets, to the General Fireproofing Co., Youngstown, O., at $17,445.

OSHKOSH, WIS.—The board of public works awarded the contract for furnishing 800 lineal feet of 4-inch, class B bell and spigot water pipe at $26 per net ton; 1,500 ft. of 6-ipch pipe at $24 a ton, and 1,000 pounds of specials at 2.75 cents per pound, to the United States Cast Iron Pipe & Foundry Co., Chicago. Clough & Co., Oshkosh, Wis., received the contract for furnishing 9,000 feet of 2 inch galvanized wrought iron lapweld pipe at $1,461.60, f. o. b., Oshkosh.

TWO RIVERS, WIS.—The Two Rivers plant of the Aluminum Goods Mfg. Co., is operating double shifts to fill an order from the war department calling for the delivery of 4,000 aluminum canteens daily until further notice. The company some time ago contracted with the government to produce 85,000 canteens, but this was followed by an order for not less than 4,000 each day.

New Trade Publications

SAND DRYERS. — The Indiana Foundry Co., Indiana, Pa., in an eight-page circular illustrates and describes its line of sand dryers which are adapted for drying sand in foundries and for other industrial purposes. These dryers are made in three sizes in capacities from three to 10 tons daily.

FROGS AND SWITCHES.—Various types of switches and crossing frogs are described in a 22-page catalog recently issued by the Helmick Foundry-Machine Co., Fairmont, W. Va. Cast iron, riveted plate, and the standard railroad frogs are thoroughly described and illustrated. Various types of switches are also explained and illustrated by drawings.

DIRECT CURRENT MOTORS. — Bulletin No. 41,010 issued by the Sprague Electric Works of the General Electric Co., describes and illustrates a line of direct current motors suitable for general shop use. This bulletin contains 19 pages and in addition to the descriptive matter includes illustrations of a number of typical installations.

LATHE CHUCKS.—Lathe and drill chucks of various kinds are fully described and illustrated in a 48-page catalog issued by The Hoggson & Pettis Mfg. Co., New Haven, Conn. The catalog includes specifications and list prices and also contains some interesting matter regarding the best method of mounting chucks.

MILL EXHAUSTERS.—Catalog No. 256, issued by the Buffalo Forge Co. contains complete specifications and numerous illustrations of many types of dust exhausters, fans, blowers, mills, etc. The catalog also includes some very valuable information on the legal aspects of the dust removal problem, together with practical hints regarding the installations of dust removing systems.

DIE-CAST PARTS.—A booklet describing various forms of die-castings produced by the H. H. Franklin Mfg. Co., Syracuse, N. Y., has just come off the press. Numerous die-castings are illustrated in the book, which also includes a record of some interesting tests of castings of this nature. Some valuable pointers for designers of die-cast parts are also included in the booklet.

BORING AND TURNING MILLS.—A bulletin issued by H. Bickford & Co., Lakeport, N. H., describes a new boring and turning mill provided with a power rapid traverse, which has been recently placed on the market by this concern. The new mills are built in five sizes, the swing varying from 50 to 96 inches. The bulletin includes complete specifications and an illustration of the machine.

METAL CEILINGS.—Catalog No. 313 issued by the Wheeling Corrugating Co., Wheeling, W. Va., describes and illustrates numerous types and styles of metal ceilings and walls. This book contains 270 9½ x 11-inch pages. Plain metal ceilings suitable for workshops are fully covered as well as the more ornate type for residences, clubs and public buildings.

PUNCHES AND SHEARS.—A thoroughly illustrated 48-page catalog has recently been issued by the Ironton Punch & Shear Co., Ironton, O., describing various types of heavy punching and shearing machines, straightening rolls, bending rolls, forging hammers, etc. Detailed specifications are given and the catalog opens with a general discussion of punching and shearing machinery which is interesting.

SHAPERS. — The Providence Engineering Works, Providence, R. I., recently issued a four-page bulletin describing its shaper. This machine is designed to combine the desirable features of both planers and shapers. The standard size machine has a 24-inch table with a horizontal tool travel of 19 inches and vertical tool feed of six inches. The various features of the machine are fully covered in the bulletin.

GEARS AND PINIONS.—A bulletin recently issued by The Van Dorn & Dutton Co., Cleveland, describes various types of railway and mill motor gears and pinions which this company manufactures. The gears are cut on special automatic machines and are all subjected to a heat treating process before they are placed in service. This bulletin contains several interesting illustrations showing portions of the company's factory.

VOLUME AND PRESSURE RECORDERS.—Various types of volume and pressure recorders are described and illustrated in a 16-page bulletin recently issued by Herman Bacharach, 14 Wood street, Pittsburgh. The elementary mechanics underlying the construction of volume and pressure recorders are fully explained and the machines themselves are also described and illustrated by half-tone plates and drawings.

ORE ANALYSES.—The Shenango Furnace Co., Pittsburgh, has issued its annual volume of ore analyses in an unusually attractive form. The book is bound in heavy special catalog paper, is printed in colors and is illustrated with many full page tinted half tones. Tables showing the analyses of the ore obtained from the various Shenango mines are included, together with information regarding pig iron, coke and allied materials.

MOTOR DRIVEN PUMPS.—The Westinghouse Electric & Mfg. Co., Pittsburgh, has recently issued a new booklet on motor driven pumps. This is thoroughly illustrated with views of installations of pumps of various kinds performing services of a varied nature. Tables are given showing the frictional heat in wrought iron pipes, the horsepower required for pumping, dimensions of pipes, etc.

TRAMRAIL SYSTEMS AND TROLLEYS. —Catalog D 1914, issued by The Brown Hoisting Machinery Co., Cleveland, illustrates and describes the construction and application of the various types of tramrail systems, trolleys and electric hoists built by this concern. The book contains 63 pages and is profusely illustrated. It includes valuable specifications of various types of hoists.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(First half delivery.)

Bessemer, valley	$14.00
Bessemer, Pittsburgh	14.90
Basic, Pittsburgh	13.90
Basic, eastern Pa.	14.00
Malleable, Pittsburgh	14.15 to 14.40
Malleable, Chicago	14.25
Malleable, Philadelphia	15.50 to 15.75
Malleable, Buffalo	13.00 to 13.50
No. 1X Philadelphia	15.00 to 15.25
No. 2 foundry, Pittsburgh	14.15 to 14.40
No. 2 foundry, Cleveland	14.25
No. 2 foundry, Ironton	13.50
No. 2 foundry, Chicago	14.25
No. 2X foundry, Philadelphia	14.75 to 15.00
No. 2X foundry, New York	14.50 to 14.75
No. 2X foundry, Buffalo	13.00 to 13.50
No. 2 plain, Philadelphia	14.50 to 14.75
No. 2 plain, New York	14.25 to 14.50
No. 2 plain, Buffalo	13.75
No. 2 southern, Birmingham	10.50 to 11.00
No. 2 southern, Cincinnati	13.75 to 14.25
No. 2 southern, Chicago	14.85 to 15.85
No. 2 southern, Philadelphia	14.75 to 15.00
No. 2 southern, Cleveland	14.85 to 15.35
No. 2 southern, New York	14.75 to 15.25
No. 2 southern, St. Louis	14.50 to 15.00
Virginia, 2X, Philadelphia	15.30 to 15.55
Virginia, 2X, Jersey City	15.60 to 15.85
Virginia 2X, New Eng., all rail	16.20 to 16.70
Gray forge (eastern Pa.)	13.90 to 14.00
Gray forge, Pittsburgh	13.65 to 13.90
Gray forge, Birmingham	9.50 to 10.00
Silveries, 5 per cent, Cleveland	17.55
Silveries, 5 per cent, Birmingham	12.50
Silveries, 5 per cent, Chicago	16.85
Silveries, 8 per cent furnace	15.75 to 16.00
Standard low phos., Phila.	21.00
Lebanon low phos., furnace	17.00 to 17.50
Low phos., Pittsburgh	21.65 to 21.90
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	15.75 to 16.50
Charcoal, Buffalo	16.00 to 17.00
Charcoal, Birmingham	25.00
Middlesbrough, No. 3, Phila., ex ship	15.00 to 15.25

IRON ORE

(Lower lake ports.)

Old range Bessemer, 55 per cent	$3.75
Mesabi Bessemer, 55 per cent	3.50
Old range, non-Bess., 51½ per cent	3.00
Mesabi, non-Bessemer, 51½ per cent	2.85

(Per unit Philadelphia.)

Foreign Bess., 50 to 65 per cent	7 to 8c
Foreign non-Bess., 50 to 65 per cent.	7 to 8c

COKE

(At the ovens.)

Connellsville furnace	$1.75 to 1.85
Connellsville fur. contr	1.85 to 2.00
Connellsville foundry	2.40 to 2.65
Connellsville fdy., contr	2.50 to 2.75
Wise county furnace	1.90 to 2.10
Wise county foundry	2.40 to 3.10
Pocahontas furnace	1.90 to 2.40
Pocahontas foundry	2.40 to 2.75
New River, foundry	2.75 to 3.50
New River, furnace	2.20 to 2.35

FERRO-ALLOYS

Ferro-manganese, Baltimore	$38.00
Ferro-silicon, 50 per cent, Pbgh.	71.00 to 73.00
Ferro-silicon, 50 per cent, Phila.	71.00 to 73.00
Ferro-sil., 12 to 13 per cent, Pgh.	22.90
Ferro-sil., 11 to 12 per cent, Pgh.	21.90
Ferro-sil., 10 to 11 per cent, Pgh.	20.90
Ferro-sil., 9 to 10 per cent, Pgh.	19.90
Ferro-carbon titanium, carloads, per lb.	8c to 12½c

SEMI-FINISHED STEEL

Bess. billets, Pbgh. and Yn.	$20.00
Open-hearth bil., Pbgh. and Yn.	20.00
Open-hearth bil., Phila.	22.40 to 23.40
Bess. sheet bars, Pbgh. and Yn.	21.00
Op.-h'th sh. bars, Pbgh. & Yn.	21.00
Forging billets, Phila.	26.40 to 27.40
Forging billets, Pittsburgh	25.00
Wire rods, Pittsburgh	26.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh	1.25c
Stand. open-hearth rails, Pbgh.	1.34c
Light rails, 8 lbs., Pbgh. or Chi.	1.40c
Lgt. rails, 12 lbs., Pbgh. or Chgo.	1.35c
Lgt. rails, 16 to 20 lb., Pbgh. or Chicago	1.30c
Lgt. rails, 25 to 45 lbs., Pbgh. or Chicago	1.25c
Relaying rails, standard, Chgo.	$23.00 to 24.00
Relaying rails, light, Chicago	21.50 to 22.50
Angle bars, st. sect. Pbgh., base	1.50c
Angle bars, st., sections, Chgo.	1.50c
Spikes, railroad, Pbgh.	1.40c to 1.45c
Spikes, railroad, Chgo.	1.55c
Track bolts, Pbgh	2.00c
Track bolts, Chgo	2.00c

SHAPES, PLATES AND BARS

Structural shapes, Pittsburgh	1.12½c to 1.15c
Structural shapes, Chicago	1.28c to 1.33c
Structural shapes, Philadelphia	1.25c to 1.30c
Structural shapes, New York	1.26c to 1.31c
Structural shapes, San Francisco	2.00c to 2.05c
Tank plates, Chicago	1.28c to 1.33c
Tank plates, Pittsburgh	1.10c to 1.15c
Tank plates, Philadelphia	1.25c to 1.30c
Tank plates, New York	1.26c to 1.31c
Bars, soft steel, Pittsburgh	1.12½c to 1.15c
Bars, soft steel, Chicago	1.28c to 1.33c
Bars, soft steel, Philadelphia	1.30c
Bars, soft steel, New York	1.31c
Hoops, carloads, Pittsburgh	1.25c

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 pounds, to:—

New York	16 cents
Philadelphia	15 cents
Boston	18 cents
Buffalo	11 cents
Baltimore	14½ cents
Cleveland	10 cents
Cincinnati	15 cents
Chicago	18 cents
Minneapolis and St. Paul	32 cents
Denver	67½ cents
St. Louis	22½ cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast, plates and shapes	80 cents

Hoops, less carloads, Pittsburgh	1.30c
Bands, Pittsburgh	1.15c
Shafting, carloads, Pbgh., disc.	65 to 66
Shaft'g less carl'ds, Pbgh., disc.	62 to 63
Bar iron, Chicago	1.10c to 1.12½c
Bar iron, Philadelphia	1.20c to 1.25c
Bar iron, New York	1.25c to 1.30c
Bar iron, Cleveland	1.20c to 1.25c
Bar iron, Pittsburgh	1.30c
Hard steel bars, Chicago	1.25c to 1.30c
Smooth finish'g mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	1.85c to 1.90c
No. 28, black, Chicago	1.98c to 2.03c
No. 28, tin mill, black, Pbgh.	1.85c to 1.90c
No. 28, galvanized, Pbgh.	2.80c to 2.85c
No. 28, galvanized, Chgo.	2.98c to 3.03c
No. 28, cor. galv., Pbgh.	3.00c to 3.10c
No. 28, painted cor., Pbgh.	2.10c to 2.20c
No. 10, blue annealed, Pbgh.	1.35c to 1.40c
No. 10, blue annealed, Phila.	1.55c to 1.60c
Tin plate, 100 lb., coke, base	$3.40

IRON AND STEEL PIPE

(Pittsburgh.)

	Black Butt-weld.	Galv. Butt-weld.
Steel, ⅜ to 3 inches	80	71½
Iron, ⅜ to 2½ inches	70	61
	Lap-weld.	
Steel, 2½ to 6 inches	79	70½

BOILER TUBES

Steel, 3½ to 4½ inches	72
Iron, 3½ to 4½ inches	60

WIRE PRODUCTS

Wire nails, jobbers, Pittsburgh	$1.50 to 1.55
Wire nails, retailers, Pittsburgh	1.55 to 1.60
Plain wire, jobbers, Pittsburgh	1.30 to 1.35
Plain wire, retailers, Pittsburgh	1.35 to 1.40
Galvanized wire, jobbers, Pbgh.	1.70 to 1.75
Galvanized wire, retailers, Pbgh.	1.75 to 1.80
Polished staples, Pbgh.	1.50 to 1.55
Galvanized staples, Pbgh.	1.90 to 1.95
Barb wire, painted, jobbers, Pbgh.	1.50 to 1.55
Barb wire, painted, retail'rs, Pbgh.	1.55 to 1.60
Barb wire, galv., retailers, Pbgh.	1.95 to 2.00
Barb wire, galv., jobbers, Pbgh.	1.90 to 1.95

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled threads, 80 and 10; cut threads, 80 and 5; larger or longer, 75 and 10.

Machine bolts with hot pressed nuts ⅜ x 4 inches, smaller or shorter, rolled, 80 and 15; cut, 80 and 10; larger or longer, 75 and 15.

Gimlet and cone point lag or coach screws, 80 and 20.

Hot pressed square, blank or tapped nuts, $6.80 off list; hot pressed hexagon blank or tapped, $7.20 off.

Cold pressed, C. & T. square, blank or tapped, $6 off; hexagon, blank or tapped, ⅜ inch and larger, $7.20; ½-inch and smaller, $7.80.

RIVETS

Structural rivets, Pbgh.	1.60c to 1.65c
Structural rivets, Chgo.	1.73c to 1.78c
Boiler rivets, Pbgh.	1.70c to 1.75c
Boiler rivets, Chgo.	1.83c to 1.88c

SCREWS

(New York.)

Lag, gimlet and cone point	80 and 20
Coach, gimlet point	80
Standard jack	70 and 10
Mch., cut thread, flat head	50 and 10
Mach., cut thread, round head	50 and 10 and 10
Mch., cut thread, fillister hd.	40 and 40 and 10
Mch., rolled thread, flat head or round head	80 and 10
Set screws, iron	75 and 10 and 10
Set screws, steel, per cent advance over iron	25
Square head cap screws	70 and 10 and 10
Hexagon head cap screws	70 and 10 and 10
Fillister head cap screws	60 and 10 and 10
Flat head wood screws	10 and 10 and 5
Round head wood screws	10 and 10 and 5

WASHERS

(Discounts, Iron or Steel, to Jobbers, Cleveland.)

⅛-inch	$7.25
⅜-inch	7.00
½-inch	7.00
⅝-inch	7.00
¾-inch	7.00

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	1.55c to 1.60c

TWISTED REINFORCING BARS

(Soft steel, Pittsburgh mill.)

¾-inch and larger	1.25c
⅝-inch	1.30c
½-inch	1.35c
⅜-inch	1.50c
¼-inch	1.75c

IRON AND STEEL PRICES

Corrected up to Tuesday noon

TACKS

(New York.)—

	Discount.
American carpet tacks	90 and 20 and 10
American cut tacks	90 and 20 and 10
Railroad tacks	90 and 40
Gimp tacks	90 and 20 and 10
Finishing nails	70

WIRE ROPE

Galvanized, iron and steel	47½ and 2½
Bright, Iron and steel	55 and 2½

TRIANGLE REINFORCING MESH

(Per 100 square feet f. o. b. mill, car loads.)

No. 4, plain	$1.00
No. 4, galvanized	1.12
No. 7, plain	.49
No. 7, galvanized	.55
No. 23, plain	1.69
No. 23, galvanized	1.88
No. 26, plain	1.17
No. 26, galvanized	1.30
No. 27, plain	.96
No. 27, galvanized	1.07
No. 31, plain	2.49
No. 31, galvanized	2.76
No. 35 plain	1.17c
No. 35 galvanized	1.30
No. 39, plain	3.05
No. 39, galvanized	3.38
No. 43, galvanized	1.23
No. 43, plain	1.10

SPIRAL RIVETED PIPE

(Per 100 linear feet, f. o. b. factory.)

4-inch, plain	$ 19.76
4-inch, galvanized	30.74
6-inch, plain	33.05
6-inch, galvanized	49.73
8-inch, plain	43.17
8-inch, galvanized	65.00
10-inch, plain	66.42
10-inch, galvanized	96.15
12-inch, plain	83.75
12-inch, galvanized	118.30
14-inch, plain	99.14
14-inch, galvanized	138.85
16-inch, plain	117.53
16-inch, galvanized	166.58
20-inch, plain	183.79
20-inch, galvanized	248.39
24-inch, plain	219.92
24-inch, galvanized	293.99
30-inch, plain	324.81
30-inch, galvanized	430.64

CAST IRON PIPE

Three to 24 in., Cleveland	$22.35 to 22.80
Four-inch, water, Chicago	26.50
Six to 12 inches, Chicago	24.50
Larger sizes, Chicago	24.00
Six inch, water, New York	20.50 to 21.50
Four-inch, water, Birmingham	21.50
Six-inch and larger, Birmingham	19.50

Gas pipe, $1 per ton higher than water.

WAREHOUSE PRICES

Steel bars, Chicago	1.65c
Steel bars, Cleveland	1.80c
Steel bars, Cincinnati	1.70c to 1.85c
Steel bars, Philadelphia	1.65c to 1.70c
Steel bars, New York	1.80c
Iron bars, Chicago	1.65c
Iron bars, Cleveland	1.75c
Iron bars, Cincinnati	1.65c to 1.75c
Iron bars, Philadelphia	1.60c to 1.65c
Iron bars, New York	1.65c to 1.70c
Hoops, Chicago	2.15c
Shapes and plates, Chicago	1.75c
Shapes and plates, Cleveland	1.90c
Shapes and plates, Cincinnati	1.80c to 1.90c
Shapes and plates, Philadelphia	1.65c to 1.70c
Shapes and plates, New York	1.85c
No. 10 blue ann. sheets, Chgo	1.95c
No. 10 blue ann. sheets, Cleve	2.15c
No. 10 blue ann. sheets, Cinci	1.95c to 2.05c
No. 28 black sheets, Chgo	2.55c
No. 28 black sheets, Cleveland	2.60c
No. 28 black sheets, Cincinnati	2.45c to 2.55c
No. 28 galv. sheets, Chgo	3.60c
No. 28 galv. sheets, Cleveland	3.60c
No. 28 galv. sheets, Cincinnati	3.45c to 3.55c

IRON AND STEEL SCRAP

(Net tons.)

No. 1 railroad wrought Chgo	$ 8.75 to 9.00
No. 1 railroad wrought, Cleve	9.50 to 10.00
No. 1 railroad wrought, St. L	7.75 to 8.00
No. 1 railroad wrought, Cinci	8.00 to 8.50
No. 2 railroad wrought, Chgo	8.25 to 8.50
No. 2 railroad wrought, St. L	7.50 to 7.75
Arch bars and transoms, Chgo	12.00 to 12.50
Arch bars and transoms, St. L	11.00 to 11.50
Knuckles, coup. and spr'gs, Chgo.	9.00 to 9.50
Knuckles, coup. and sp'gs, St. L.	9.00 to 9.25
Shafting, Chicago	11.50 to 12.00
Shafting, St. Louis	13.00 to 13.50
Steel car axles, Chgo	12.25 to 12.50
Steel car axles, St. Louis	11.50 to 11.75
Locomotive tires, Chicago	9.75 to 10.00
Locomotive tires, St. Louis	9.00 to 9.50
Cut forge, Chicago	8.25 to 8.50
Pipes and flues, Chicago	6.50 to 7.00
Pipes and flues, Cleveland	8.00 to 8.50
Pipes and flues, St. Louis	6.50 to 7.00
No. 1 cast, Chicago	10.00 to 10.50
No. 1 cast, Cleveland	10.75 to 11.00

Freight Rates, Coke

Connellsville regions, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.70
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley furnaces	1.20
Cincinnati	2.00

No. 1 cast, Cincinnati	$ 9.25 to 9.75
No. 1 cast, St. Louis	10.00 to 10.50
No. 1 busheling, Chicago	7.25 to 7.75
No. 1 busheling, Cleveland	8.50 to 9.00
No. 1 busheling, Cincinnati	6.00 to 6.50
No. 1 busheling, St. Louis	7.50 to 8.00
No. 2 busheling, Chicago	5.75 to 6.25
No. 1 boiler plate, cut, Chgo	6.50 to 7.00
No. 1 boiler plate, cut, Buffalo	9.00 to 9.50
No. 1 boiler plate, cut, St. L	6.00 to 6.50
Boiler punchings, Chicago	9.00 to 9.25
Cast borings, Chicago	4.75 to 5.25
Cast borings, Cleveland	6.00 to 6.50
Cast borings, Cincinnati	4.25 to 4.75
Cast borings, St. Louis	4.00 to 4.50
Machine shop turnings, Chgo	5.25 to 5.50
Machine shop turnings, Cleve	5.50 to 6.00
Machine shop turnings, Cinci	4.50 to 5.00
Machine shop turnings, St. L	4.50 to 5.00
Malleable, agricultural, Chgo	8.25 to 8.75
Malleable, agricultural, St. Louis	7.25 to 7.50
Malleable, railroad, Chicago	9.25 to 9.75
Malleable, railroad, Cincinnati	6.50 to 7.00
Malleable, railroad, St. Louis	8.00 to 8.25
Angle bars, iron, Chgo	11.75 to 12.25
Angle bars, iron, St. Louis	10.00 to 10.50
Angle bars, steel, Chgo	8.25 to 8.75
Angle bars, steel, St. Louis	9.00 to 9.50
Stove plate, Chicago	9.25 to 9.75
Stove plate, Cleveland	8.25 to 8.75
Stove plate, Buffalo	9.75 to 10.00
Stove plate, Cincinnati	7.00 to 7.50
Stove plate, St. Louis	7.50 to 8.00
Bundled sheet, Cincinnati	4.75 to 5.25
Wrought iron pil'g plates, Clev	13.00

(Gross Tons.)

Heavy melting steel, Pbgh	$12.00
Heavy melting steel, Buffalo	10.00 to 10.50
Heavy melting steel, Chicago	9.75 to 10.00
Heavy melting steel, Cleveland	10.00 to 10.75
Heavy melting steel, Cincinnati	9.00 to 9.50
H'vy melting steel, eastern Pa	10.75 to 11.00
Heavy melting steel, New York	8.50 to 8.75
Heavy melting steel, St. Louis	11.00 to 11.50
Bundled sheet, Buffalo	6.25 to 6.50
Grate bars, Buffalo	9.50 to 10.00
Grate bars, New York	5.75 to 6.00
No. 1 railroad wr'ght, east, Pa	12.50 to 12.75
No. 1 railroad wrought, Pbgh	11.00 to 11.50
No. 1 R. R. wght., New York	10.25 to 10.50
No. 1 R. R. wrought, Buffalo	11.00 to 11.50
Shafting, New York	12.00 to 12.50
Pipes and flues, New York	8.00 to 8.25
Pipes and flues, eastern Pa	9.25 to 9.75
Mch. shop turnings, New York	5.75 to 6.00
Machine shop turnings, Buffalo	5.50 to 6.00
Mch. shop turnings, Pbgh	7.75 to 8.00
Mch. shop turnings, eastern Pa	7.50 to 8.00
Cast borings, New York	5.75 to 6.00
Cast borings, eastern Pa	8.00 to 8.50
Cast borings, Buffalo	6.00 to 6.50
Cast borings, Pittsburgh	7.75 to 8.00
Stove plate, (Jersey points)	8.50 to 8.75
Stove plate, Pittsburgh	10.00 to 10.25
Stove plate, eastern Pa	8.50 to 9.00
Shoveling steel, Chicago	9.25 to 9.50
Shoveling steel, St. Louis	9.00 to 9.50
Reroll'g rails, 5 ft. & ov., Pbgh.	13.00 to 13.25
Reroll. rails, 5 ft. and ov., Chgo.	11.25 to 11.75
Reroll. rails, 5 ft. and ov., Cleve.	11.75 to 12.25
Reroll. rails, 5 ft. & ov., E. Pa.	12.25 to 12.75
Reroll. rails, 5 ft. and ov., St. L.	12.00 to 12.50
Steel rails, short, Chicago	10.50 to 10.75
Steel rails, short, Cleveland	13.00 to 13.50
Steel rails, short, eastern Pa	11.00 to 11.25
Steel rails, short, St. Louis	11.50 to 12.00
Iron rails, Cleveland	13.50 to 14.00
Iron rails, Cincinnati	10.50 to 11.00
Iron rails, eastern Pa	15.00 to 16.00
Iron rails, St. Louis	12.00 to 12.25
Frogs, switches, guards, Chgo.	9.50 to 9.75
Frogs, switches and g'rds, St. L.	10.25 to 10.50
Car wheels, (iron), Pittsburgh	12.00 to 12.50
Car wheels, (steel), Pittsburgh	13.00 to 13.50
Car wheels, Chicago	11.25 to 11.50
Car wheels, eastern Pa	11.25 to 11.50
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Cleveland, Ohio

Elastic and Vulcanite Wheels

(*Continued from page* 1016.)

should not be used in oil or caustic soda. The oil will soften the bonding material, and the wheel will quickly wear down, while caustic soda will disintegrate the wheel structure. This does not hold with vulcanite wheels, as they can be run in both these lubricants, without injury to, or the disintegration of the bond and abrasive.

For cutting-off work, a wheel speed of 9,000 to 11,000 surface feet per minute has been found most efficient. For most operations, outside of cutting off, a wheel speed of 5,000 to 6,000 surface feet per minute is recommended.

Cutting-off wheels will do work which no edged cutting-off tool or saw can do, that is cut-off unannealed high-speed steel lathe tools with the minimum amount of waste.

A few words concerning the machines upon which these wheels are mounted may not be out of order. The machines are very simple, having merely a support for the wheel and another for the piece to be cut off.

For cutting off small, light pieces, the wheel is stationary and the work carried to it, while on long, unwieldy pieces the work is kept stationary and the wheel brought to it.

These machines will cut off steel, iron, brass, bronze, copper, nickel tubing or pipe, or any other metal up to 3 inches diameter. They will also cut off pieces of any shape and practically any material to 2 inches diameter. One manufacturer of these machines states that "more solid stock, not over 1¼ inches diameter, can be cut off in one hour than can be cut with a power hack saw in 15 hours." "The machine can cut off a tube or pipe in less time than it takes to set the tools to do it in any other way, and besides it cuts off the work perfectly square and does not reduce the area of the pipe by raising a large burr on the inside of it. In fact this machine is to metal workers what the band saw is to the carpenter."

Performances

One-inch diameter and one-half inch diameter wrought iron piping is cut off in 11 to 12 seconds and 6 to 7 seconds respectively by a 30 grade 8 alundum vulcanite wheel.

In cutting through bars of machinery, steel 1½ x ½ inch cross-section a 20-inch grade 3 alundum elastic wheel cut at the rate of 4.70 inches per minute, while a vulcanite wheel made of alundum only passed through 3.31 inches of the same bar per minute. The elastic wheel wore slightly more, but did not burn the bar as did the vulcanite wheel. The softer metals are cut off much quicker than the hardened and alloy steels.

To show the difference in speed of cutting metals, a test was made on a bar of gray cast iron and a bar of machinery steel of 1½ x ½ inch cross-section under the same pressure. A vulcanite wheel cut through the machinery steel bar in 25 seconds, while it cut through the cast iron bar in 18 seconds.

An illustration tending to show the efficiency of modern abrasives over emery is found in the following: Two wheels, one of emery and one of alundum were made to the same grain combination and grade. When tried on the same bar of steel under identical conditions, the alundum wheel cut through 3.62 inches and the emery wheel through 2.50 inches of metal per minute, which shows 45 per cent faster cutting ability and with less wear for the alundum wheel. However, as a general rule, elastic wheels cut approximately one-third faster, but wear three times more than vulcanite wheels.

Sometimes trouble is encountered by the wheels crumbling. This may be due to either of three causes, the first being excessive heat, which softens the bond. This may be eliminated by varying the pressure under which the work is applied to the wheel, using a softer wheel, or by a combin-

ation of both. Second, too low a wheel speed will cause the wheel to act softer and crumble under heavy pressure. Third, too coarse a sized grit for the operation in question, for which anyone would naturally substitute a finer wheel.

These wheels are in a way self-truing, and therefore give little trouble on this account. However the more and the oftener the wheels get out of truth and knock against the material being ground, the faster they will cut through the material, but with resulting greater wheel wear.

For general purpose cutting off wheels, where the speed of cutting is not a large factor, vulcanite seems to be the better wheel. However, for cutting off tempered tool steel or alloy steel tools, where cool cutting is the main consideration, then the elastic wheels can undoubtedly be used to better advantage on account of their softer grades and resulting cooler grinding action.

While elastic and vulcanite wheels are being used somewhat on operations outside of slotting, grooving, nicking and cutting off, they are slowly but surely being superseded by wheels manufactured by the vitrified process. The more porous structure of the latter wheels allows of a much freer and cooler grinding action, with a proportionate increased production, and in these days of high efficiency increased production is the keystone of success. However, for slotting work, where a thin wheel is required, it will be impossible to replace wheels made by the elastic and vulcanite processes.

Big American Junk Pile

The value of the "secondary metals", exclusive of gold, silver, platinum and iron, recovered in the United States in 1913 was $72,845,000, according to J. P. Dunlop, of the United States Geological Survey. Even this large figure is a decrease compared with 1912, when the value was $77,396,000.

The term "secondary" is applied to metals recovered from scrap metal, sweepings, skimmings, drosses, etc., as distinguished from "primary metals", which are derived from ore, but without implication that the secondary metals are of inferior quality. The Survey figures reveal only in a partial way the vast extent of the waste-material industry, which yearly becomes greater and better organized. The value of old iron and steel reused exceeds that of remelted brass, and the value of old rubber and paper stock amounts to many millions of dollars.

For a few purposes requiring especial purity of material it is necessary to employ primary or virgin pig metal, but as a general rule secondary metals can be used in whole or in part, and most foundries use them. Over 90 per cent of the refining and smelting of drosses and scrap metals in the United States is confined to the territory east of St. Louis and north of Ohio river.

The amount of secondary copper (including that in brass) recovered in 1913 was 136,500 tons, being over 22 per cent of the primary copper smelted from domestic ores during the year.

The secondary lead recovered amounted to 72,834 tons, equal to nearly 17 per cent of the refined lead produced from domestic ores.

The output of secondary zinc was 79,570 tons, equal to 23 per cent of the production of primary zinc.

The recovery of secondary tin is of especial importance, for practically no domestic tin ore was smelted in the United States, and the secondary tin recovered in 1913 (14,178 tons, valued at $12,567,379) was more than 27 per cent of the tin imported during the year.

In aluminum the recoveries in 1913 amounted to 4,654 tons, valued at $2,199,480.

Copies of the detailed survey statement of the secondary metal output can be had on application to the Director, U. S. Geological Survey, Washington, D. C.

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